Best Available Control Technology (BACT) Determination for the Zia II Gas Plant Permit No. PSD 5217-M1

The following Table A-1 summarizes the Prevention of Significant Deterioration (PSD) BACT Determination completed by the New Mexico Air Quality Bureau (NMED-AQB) in accordance with 20.2.74.7.k and 20.2.74.302 NMAC for the Zia II Gas Plant. Tables 1 through 24 provide the detailed analyses for all equipment and pollutants for which PSD BACT is required.

The pollutants subject to PSD BACT review were: NOx, CO, O3 (VOC), PM-10, PM-2.5, SO2, and GHG (CO2e).

A PSD BACT determination was completed for permit number PSD5217-M1 only for new units added to the facility or for existing units whose operations and/or capacities changed since permit number PSD5217 was issued on 4-25-14.

Most of the BACT requirements were established in NSR PSD5217 and did not require re-evaluation in the revised permit number PSD5217-M1, unless the emissions unit was new or there was a change to the operations, emission rates, and/or capacity of the unit. A re-evaluation of PSD BACT requirements was not required for the permitted, unchanged emissions units since they are considered 'new units' in the PSD regulation at 20.2.74.7.U NMAC and the actual construction had started on the permitted, unchanged units within 18 months of the original permit PSD5217 issuance (20.2.74.300.C NMAC). In the PSD regulation, a "new unit" is one that was newly constructed and that has existed for less than 2 years from the date such emissions unit first operated.

The bolded units in Table A-1 are those whose PSD BACT requirements were evaluated for permit number PSD5217-M1 and are subject to the 30-day comment period on the Department's preliminary determination. Please note that BACT re-evaluation of existing units did not necessarily result in a change to the BACT limits and/or control requirements.

Existing units whose operations, emission rates, and/or capacity changed in PSD5217-M1:

- heaters (units H1 and H3-H6) (Table 8 through 14 analysis)
- unit HAUL (the haul road will now be paved) (Table 24 analysis)
- fugitive releases (associated with new units)
- and Flares FL1 and FL2 (Table 22 analysis)

Units added in PSD5217-M1:

- Lusk Emergency Flare Unit FL3 (Table 22 analysis)
- diesel emergency generator (unit GEN-1) (Table 25 to 30 analysis)
- wet surface air cooler (unit CT-1) (Table 31 analysis)
- Startup, shutdown, and maintenance for compressor blowdowns and plant venting

For the flares the BACT control requirements did not change. However, some pph and the CO2e tpy numeric BACT limits for the flares either increased or decreased. The emissions increases or decreases to flare FL1 and FL2 were based on changes to the flare volumes released and the frequency/length of flaring events.

Heaters H5 and H6 decreased in capacity from 114 MMBtu/hr to 99 MMBtu/hr, however, the numerical BACT limits remain the same based on the BACT found for heaters ranging from 50 to 100 MMBtu/hr in the RBLC database.

Units where BACT was not re-evaluated in permit number PSD5217-M1 include: 4SLB RICE units C1-E to C1-10; amine sweetening unit; tanks TK-2100, 2200, 6100, and 6150; TEG dehydrator; Vapor Combustion Device VCD1; fugitives FUG; and Truck Loadout L1. Although the VOC mass emission rates from unit FUG increased due to the installation of new equipment, BACT requirements were not re-evaluated since the emission factors and other assumptions used in the emissions estimates did not change.

Table A-1: Overall Summary of BACT Limits.

Emission Unit(s)		**Pollutant**	**BACT Limit (numerical figure implemented)**	**BACT Control Method (implemented BACT)**	**BACT Floor Source**[1]	**Table Numbers for this BACT**
RICE Compressor Engines	C1-E to C10-E	NOx	0.50 g/bhp-hr for all engines (4735 hp, C1-C8; and 2370 hp engines, C9-C10)	engines built with lean burn technology and air/fuel ratio (AFR) controller, and GCP[2]	NSPS JJJJ at 1.0 g/hp-hr or 82 ppmvd	1
	C1-E to C8-E	CO	0.05 g/bhp-hr	Catalytic oxidation and GCP	NSPS JJJJ at 2.0 g/hp-hr or 270 ppmvd	2
	C9-E to C10-E		0.175 g/bhp-hr			2
	C1-E to C8-E	VOC	0.20 g/bhp-hr	Catalytic oxidation and GCP	NSPS JJJJ at 0.7 g/hp-hr or 60 ppmvd	3
	C9-E to C10-E		0.30 g/bhp-hr			3
	C1-E to C10-E	PM-10 and PM-2.5	9.99 E-03 lb/MMBtu	GCP and pipeline quality natural gas[3]		4 and 5
	C1-E to C10-E	SO2	5 gr total S/100 scf gas	Pipeline quality natural gas		6
	C1-E to C8-E	CO2e	16,029 tpy	GCP, pipeline quality natural gas, monitoring		7

Emission Unit(s)		Pollutant	BACT Limit (numerical figure implemented)	BACT Control Method (implemented BACT)	BACT Floor Source[1]	Table Numbers for this BACT
	C9-E to C10-E		10,101 tpy	fuel flow (rate and volume) and fuel heat values		7
Heaters	**H4, H5**	**NOx**	**0.06 lb/MMBtu (59.5 lb/MMscf)**	**Low NOx burners and GCP**		**8**
	H1, H3, H6		**0.049 lb/MMBtu (48.6 lb/MMscf)**	**Low NOx burners and GCP**		**8**
	H4, H5	**CO**	**0.041 lb/MMBtu (40.6 lb/MMscf)**	**GCP**		**9**
	H1, H3, H6		**0.082 lb/MMBtu (81.6 lb/MMscf)**	**GCP**		**9**
	H1, H3, H4, H5, H6	**VOC**	**0.0054 lb/MMBtu (5.3 lb/MMscf)**	**GCP**		**10**
	H1, H3, H4, H5, H6	**PM-10 and PM-2.5**	**0.0075 lb/MMBtu (7.4 lb/MMscf)**	**GCP and pipeline quality natural gas**		**11 and 12**
	H1, H3, H4, H5, H6	**SO2**	**5 gr total S/100 scf gas**	**Pipeline quality natural gas**		**13**
	H1, H3, H4, H5, H6	**CO2e**	**117 lb/MMBtu (115,623 lb/MMscf)**	**GCP, pipeline quality natural gas, monitoring fuel flow (rate and volume) and fuel heat values**		**14**

Emission Unit(s)		**Pollutant**	**BACT Limit (numerical figure implemented)**	**BACT Control Method (implemented BACT)**	**BACT Floor Source**[1]	**Table Numbers for this BACT**
Amine (amine unit)		VOC	100% capture via flash tank and AGI, 98% DRE by FL2 (zero emissions at amine still and flash tank vents)	AGI[4], flare (FL2) for SSM, flash gas recycle to inlet		15
		CO2e	100% capture via flash tank and AGI, 98% DRE by FL2, (zero emissions at amine still and flash tank vents)			16
Dehy (dehydrator)		VOC	Flash Tank – 100% capture and control Still Vent – 100% capture, 98% DRE by VDC1 (zero emissions at Dehy still and flash tank vents)	VCD1-98% DRE[5], still vent to condenser then to VCD1, flash gas recycle to low pressure inlet		17
		CO2e	Flash Tank – 100% capture and control Still Vent – 100% capture, 98% DRE by VCD1 (zero emissions at dehy still and flash tank vents)			18

Emission Unit(s)		Pollutant	BACT Limit (numerical figure implemented)	BACT Control Method (implemented BACT)	BACT Floor Source[1]	Table Numbers for this BACT
TK2100, TK2200, TK-C, TK-6100, TK-6150 (storage tanks)		VOC CO2e	100% capture, 98% DRE by VCD1 (zero emissions at tanks)	Fixed roof with blanket gas, submerged fill pipe, vented to VCD1.	NSPS OOOO 95% Control if VOC PTE 6 tpy or more Per federally enforceable permit conditions, exempt from NSPS OOOO	19
L1 (tank load-out to trucks)		VOC	100% capture, 98% DRE by VCD1 (zero emissions at load-out)	Submerged loading and vented to VCD1		20
VCD1 (vapor combustion device)		NOx	0.098 lb/MMBtu	GCP	40 CFR 60.5400(a) (NSPS OOOO) refers to NSPS VVa at 60.482-10a (c) 95% VOC control requirement	21
		CO	0.082 lb/MMBtu	GCP		
		VOC	0.21 lb/MMBtu	GCP, 40 CFR 60.482-10a(c) and 98% DRE[4]		
		CO2e	117 lb/MMBtu	GCP and pipeline quality natural gas		

Emission Unit(s)		Pollutant	BACT Limit (numerical figure implemented)	BACT Control Method (implemented BACT)	BACT Floor Source[1]	Table Numbers for this BACT
Flares	**FL1, FL2, FL3**	**NOx, CO, VOC, PM-10, PM-2.5, SO2, and CO2e**	**FL1: 799.4 pph NOx, 4349.6 pph CO, 2942.1 pph VOC, 14977.1 pph SO2, 1404 tpy CO2e pilot/purge, 7922 tpy CO2e SSM FL2: 102.2 pph NOx, 555.6 pph CO, 7.8 pph VOC, 4409.8 pph SO2, 1404 tpy CO2e pilot/purge, 2386 tpy CO2e SSM FL3 (pilot/purge only), 0.2 pph NOx, 0.7 tpy NOx, 0.8 pph CO, 3.7 tpy CO, 0.01pph VOC, 0.05 tpy VOC, 1404 tpy CO2e**	**GCP, pipeline quality natural gas for the pilot, limitations on vented gases (SSM limits), 40 CFR 60.18 , 98% DRE[4] for VOC, CH4**	**40 CFR 60.18 requirements**	**22**
FUG (fugitives)		VOC	no numerical BACT emission limit	LDAR program	NSPS OOOO at 500 ppm leak detection	23
haul road	**HAUL**	**PM-10 and PM-2.5**	**no numerical BACT emission limit**	**Paved road**		**24**

Emission Unit(s)		Pollutant	BACT Limit (numerical figure implemented)	BACT Control Method (implemented BACT)	BACT Floor Source[1]	Table Numbers for this BACT
diesel emergency generator	**GEN-1**	**NOx, CO, VOC, PM-10, PM-2.5, SO2, and CO2e**	**3.3 g/bhp-hr NOx, 3.7 g/bhp-hr CO, 0.18 g/bhp-hr VOC, 0.3 g/bhp-hr PM-10 and PM-2.5, 15 ppm sulfur 163 lb/MMBtu CO2e**	**Ultra low sulfur diesel fuel, air/fuel ratio controller, GCP, turbocharged and charge air cooled**	**EPA Tier 3 and NSPS IIII**	**25 to 30**
wet surface air cooler	**CT-1**	**PM-10, PM-2.5**	**99.995% control**	**drift eliminator**		**31**

1. Stated as BACT floor even if not subject to a standard per PTE. See NSPS/NESHAP requirements in permit.
2. GCP = Good Combustion Practices.
3. Pipeline Quality Natural Gas = natural gas with no more than 5 grains of total sulfur (S)/100 scf and after processing through inlet separator, amine unit, and TEG Dehydrator to remove impurities.
4. AGI = Acid gas injection well.
5. DRE = Destruction rate efficiency.

Following this overall summary of BACT (Table A-1) are unit specific tables (Tables 1 through 31). The applicant provided their BACT analysis laid out in an organized tabular fashion (for most pollutants/equipment). There were also comments and information about control efficiency, economics, feasibility, and other environmental considerations in the text of the applicant's BACT analysis. The AQB reviewed and verified the applicant's analysis and also completed its own research to complete the BACT determination. For cost analysis details, refer to the applicant's cost analyses located in their BACT analysis.

See BACT Review Tables 8 to 14, 22, and 24 to 31 BACT determinations subject to permit PSD-5217-M1.

Table 1. Compressor Engine (RICE): Natural Gas Fired: NOx BACT (Units C1-E to C10-E)

	Control Technologies →→→			
	Selective Catalytic Reduction (SCR)[a]	**Non-Selective Catalytic Reduction (NSCR)**	**Clean Burn Technology**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Nitrogen-based reagent (e.g., NH_3, urea) is injected into exhaust stream downstream of combustion unit. The reagent reacts selectively with NOx to produce N_2 and water in a reactor vessel containing a metallic or ceramic catalyst. Temps 480 - 800 °F (variations ± 200 °F); inlet NOx concentration as low as 20 ppm (efficiency improves with increased concentration up to 150 ppm). Unreacted reagent may form ammonium sulfates which may plug or corrode downstream equipment. Particulate-laden streams may blind the catalyst and may necessitate the application of a sootblower.	**Applicant:** This technique uses residual hydrocarbons and CO in rich-burn engine exhaust as a reducing agent for NOx. In an NSCR, hydrocarbons and CO are oxidized by O_2 and NOx. The excess hydrocarbons, CO, and NOx pass over a catalyst (usually a noble metal such as platinum, rhodium, or palladium) that oxidizes the excess hydrocarbons and CO to H_2O and CO_2, while reducing NOx to N_2[b].	**Applicant:** Natural gas fueled engines that operate with a fuel-lean air/fuel ratio are capable of low NOx emissions. **AQB:** "Clean burn" technology means low NOx, "lean burn" as in NSPS Subpart JJJJ. The fuel/air ratio is kept well below ideal stoichiometric level to limit NOx.	**Applicant:** NOx emissions are caused by oxidation of N_2 in the combustion air during fuel combustion. This occurs due to high combustion temperatures and insufficiently mixed air and fuel in the cylinder where pockets of excess oxygen occur. These effects can be minimized through air-to-fuel ratio control, ignition timing reduction, and fuel quality analysis and fuel handling. **AQB:** This approach implements the guidelines published by USEPA.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of NOx emissions from large natural gas-fired lean-burn stationary internal combustion engines. Technically infeasible for engines operating at variable loads.	**Applicant:** Not included in RBLC for the control of NOx emissions from large natural gas-fired lean-burn stationary internal combustion engines. Lean-burn engine cannot be retrofitted with NSCR due to reduced exhaust temperatures. NSCR is limited to engines with normal exhaust oxygen levels of 4% or less including 4SRB naturally aspirated and 4SRB turbocharged. Technically infeasible.	**Applicant:** Included in RBLC for the control of NOx emissions from large combustion engines. Originally in the application, 0.7 g/bhp-hr for NOx was going to be BACT for the eight G3616 engines at 4445 hp (C1 to C8). These engines went out of manufacturing and no longer available. The applicant is now using 4735 hp engines at 0.5 g/bhp-hr for NOx. This will result in reduced NOx emissions from original facility design.	**Applicant:** Included in RBLC for the control of NOx emissions from large combustion engines.
Technically Feasible?	**No**	**No**	**Yes**	**Yes**
Evaluate Energy, Environment, Indirect economic	N/A, not technically feasible	N/A, not technically feasible	**AQB:** Although the new 4735 hp G3616 engines to be used are more hp, NOx emissions are much less (-57.5 tpy, cumulatively for 8 engines, C1 to C8), resulting in less NOx emissions compared to the original version of the permit application.	N/A is BACT
Economic analysis	N/A, not technically feasible	N/A not technically feasible	N/A is BACT	N/A is BACT
BACT Selection	N/A, not technically feasible	N/A, not technically feasible	BACT Floor: NSPS JJJJ provides a NOx limit of 1.0 g/hp-hr (82 ppmvd) per Table 1. **BACT Limit of 0.5 g/bhp-hr**[c] for all engines: G3608, 2370 hp, **Units C9 to C10;** and the G3616, 4735 hp, **Units C1 to C8**. Also for all engines: at 15% O_2 utilizing lean burn technology and good combustion practices.	**AQB:** This approach goes in tandem with clean burn technology.

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Selective Catalytic Reduction (SCR))," EPA-452/F-03-032.
b. U.S. EPA, AP-42, Section 3.2 "Natural Gas-Fired Reciprocating Engines"

c. Texas Commission on Environmental Quality (TCEQ) Combustion Sources: Current best available control technology (BACT) guidelines. 2010. http://www.tceq.texas.gov/permitting/air/nav/air_bact_combustsources.html

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 2. Compressor Engine (RICE): Natural Gas Fired: CO BACT (Units C1-E to C10-E)

	Control Technologies →→→			
	Regenerative Thermal Oxidizer	**Recuperative Thermal Oxidizer**	**Catalytic Oxidation**[d]	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Oxidizes combustible materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. At temps of 1,400 - 1,500 °F[b] ; inlet flow rate 5,000 - 500,000 scfm[b] ; inlet CO concentration as low as 100 ppmv or less[b]	**Applicant:** Oxidizes combustible materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. At temps of 1,100 - 1,200 °F[c] ; inlet flow rate 500 - 50,000 scfm[c] ; inlet CO concentration as low as 100 ppmv or less[b]. **AQB:** The citation for CO at 100 ppmv is for regenerative TO. The correct cite for recuperative CO is 1500-3000 ppmv[c].	**Applicant:** Similar to thermal incineration; waste stream is heated and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. At temps of 600 - 800 °F (not to exceed 1,250 °F). Inlet flow rate 700 - 50,000 scfm. Inlet CO concentration as low as 1 ppmv.	**Applicant:** Continued operation of the engine at the appropriate oxygen range and temperature to promote complete combustion and minimize CO formation. **AQB:** This approach implements the guidelines published by USEPA.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of CO emissions from large natural gas-fired lean-burn stationary internal combustion engines.	**Applicant:** Not included in RBLC for the control of CO emissions from large natural gas-fired lean-burn stationary internal combustion engines. not technically feasible	**Applicant:** Widely accepted as BACT for control of CO emissions from internal combustion engines.	**Applicant:** Included in RBLC for the control of CO emissions from internal combustion engines.
Technically feasible?	**No**	**No**	**Yes**	**Yes**
Other	**Applicant:** Thermal oxidizers do not reduce emissions of CO from properly operated natural gas combustion units without the use of a catalyst. Not technically feasible	**Applicant:** Thermal oxidizers do not reduce emissions of CO from properly operated natural gas combustion units without the use of a catalyst. Not technically feasible	**Applicant:** Oxidation efficiency depends on exhaust flow rate and composition. Residence time required for oxidation to take place at the active sites of the catalyst may not be achieved if exhaust flow rates exceed design specifications. **Efficiency: 93-98%.**	**AQB:** BACT Floor: NSPS JJJJ provides a CO limit of 2 g/hp-hr (270 ppmvd) for compressor engines when burning natural gas (Table 1). As reported by DCP and checked by AQB, DCP will implement BACT Limits of: **0.05 g/bhp-hr** for the Caterpillar G3616 compressor engines (**C1 to C8**); and **0.175 g/bhp-hr** for the Caterpillar G3608 compressor engines (**C9 to C10**); utilizing catalytic oxidation and good combustion practices.
Evaluate Energy, Environment, Indirect economic	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
Economic analysis	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
BACT Selection	**No**	**No**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.
b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Regenerative Incinerator)," EPA-452/F-03-021.
c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Recuperative Incinerator)," EPA-452/F-03-020.
d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 3. Compressor Engine (RICE): Natural Gas Fired: VOC BACT (Units C1-E to C10-E)

	Control Technologies →→→			
	Regenerative Thermal Oxidizer	**Recuperative Thermal Oxidizer**	**Catalytic Oxidation**[d]	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Oxidizes combustible materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. At temps of 1,400 - 1,500 °F[b] ; inlet flow rate 5,000 - 500,000 scfm[b] ; inlet VOC concentration as low as 100 ppmv or less[b]	**Applicant:** Oxidizes combustible materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion.[a] At temps of 1,100 - 1,200 °F[c] ; inlet flow rate 500 - 50,000 scfm[c] ; inlet VOC concentration as low as 100 ppmv or less[b]. **AQB:** The applicant made a citation mistake for VOC at 100 ppmv. This is the citation for regenerative TO. The correct cite for recuperative VOC is 1500-3000 ppmv[c].	**Applicant:** Similar to thermal incineration; waste stream is heated and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. At temps of 600 - 800 °F (not to exceed 1,250 °F). Inlet flow rate 700 - 50,000 scfm. Inlet VOC concentration as low as 1 ppmv.	**Applicant:** Continued operation of the engine at the appropriate oxygen range and temperature to promote complete combustion and minimize VOC formation. **AQB:** This approach implements the guidelines published by USEPA.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of VOC emissions from natural gas-fired stationary internal combustion engines.	**Applicant:** Not included in RBLC for the control of VOC emissions from natural gas-fired stationary internal combustion engines.	**Applicant:** Widely accepted as BACT for control of VOC emissions from natural gas-fired stationary internal combustion engines.	**Applicant:** Included in RBLC for the control of VOC emissions from natural gas-fired stationary internal combustion engines.
Technically feasible?	**No**	**No**	**Yes**	**Yes**
Other	**Applicant, but wording modified by AQB:** Thermal oxidizers would not effectively reduce emissions of VOC from properly operated natural gas-fired stationary internal combustion engines that are already using a catalyst.	**Applicant, but wording modified by AQB:** Thermal oxidizers would not effectively reduce emissions of VOC from properly operated natural gas-fired stationary internal combustion engines that are already using a catalyst.	**Applicant:** Oxidation efficiency depends on exhaust flow rate and composition. Residence time required for oxidation to take place at the active sites of the catalyst may not be achieved if exhaust flow rates exceed design specifications. **Efficiency: 47-68%.**	BACT Floor: NSPS JJJJ provides a VOC limit of 0.7 g/hp-hr (60 ppmvd) at 15% O2 for compressor engines when burning natural gas (Table 1). As reported by DCP and checked by AQB, DCP will implement BACT Limits of: **0.20 g/bhp-hr** for the Caterpillar G3616 compressor engines (**C1 to C8**); and **0.3 g/bhp-hr** for the Caterpillar G3608 compressor engines (**C9 to C10**); all at 15% O2 utilizing catalytic oxidation and good combustion practices.
Evaluate Energy, Environment, Indirect economic	**Applicant:** Additional fuel is required to reach the ignition temperature of the waste gas stream.	**Applicant:** Additional fuel is required to reach the ignition temperature of the waste gas stream.	N/A is BACT	N/A is BACT
Economic analysis	**Applicant:** None provided. **AQB:** Per EPA, $115 to $23,000 per metric ton, annualized cost per ton of pollutant controlled[b].	N/A, not technically feasible	N/A is BACT	N/A is BACT
BACT Selection	**No**	**No**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Regenerative Incinerator)," EPA-452/F-03-021.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Recuperative Incinerator)," EPA-452/F-03-020.

d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 4. Compressor Engine (RICE): Natural Gas Fired: PM-10/PM2.5 Filterable BACT (Units C1-E to C10-E)

	Control Technologies →→→				
	Baghouse / Fabric Filter[a]	**Electrostatic Precipitator (ESP)[b,c,d]**	**Cyclone[e]**	**Pipeline Quality Natural Gas[f]**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Process exhaust gas passes through a tightly woven or felted fabric arranged in sheets, cartridges, or bags that collect PM via sieving and other mechanisms. The dust cake that accumulates on the filters increases collection efficiency. Various cleaning techniques include pulse-jet, reverse-air, and shaker technologies. Up to 500 °F (Typical); inlet flows 100 - 100,000 scfm (Standard), 100,000 - 1,000,000 scfm (Custom); inlet PM concentration 0.5 - 10 gr/dscf (Typical), 0.05 - 100 gr/dscf (Achievable)	**Applicant:** Electrodes stimulate the waste gas and induce an electrical charge in the entrained particles. The resulting electrical field forces charged particles to collector walls from which the material may be mechanically dislodged and collected in dry systems or washed with water deluge in wet systems. Up to 1,300 °F (dry), Lower than 170 - 190 °F (wet); inlet flow 1,000 - 100,000 scfm (Wire-Pipe), 100,000 - 1,000,000 scfm (Wire-Plate); inlet PM concentration 0.5 - 5 gr/dscf (Wire-Pipe), 1 - 50 gr/dscf (Wire-Plate)	**Applicant:** Centrifugal forces drive particles in the gas stream toward the cyclone walls as the waste gas flows through the conical unit. The captured particles are collected in a material hopper below the unit. Up to 1,000 °F; inlet flow 1.1 - 63,500 scfm (single) up to 106,000 scfm (in parallel); inlet PM concentration 0.44 - 7,000 gr/dscf	**Applicant:** Combusting only natural gas, which has an inherently low sulfur content, rather than higher sulfur content fuels alone or in combination with natural gas.	**Applicant:** Operate and maintain the equipment in accordance with good air pollution control practices and with good combustion practices.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of PM emissions for natural gas-fired stationary internal combustion engines. Fabric filters are susceptible to corrosion and blinding by moisture. Appropriate fabrics must be selected for specific process conditions. Natural-gas fired internal combustion engines generate low PM emissions and have large exhaust flowrates, resulting in very low concentrations of PM. Add-on control devices would not provide any measurable emission reduction.	**Applicant:** Not included in RBLC for the control of PM emissions for natural gas-fired stationary internal combustion engines. Natural-gas fired internal combustion engines generate low PM emissions and have large exhaust flowrates, resulting in very low concentrations of PM. Add-on control devices would not provide any measurable emission reduction.	**Applicant:** Not included in RBLC for the control of PM emissions for natural gas-fired stationary internal combustion engines. Natural-gas fired internal combustion engines generate low PM emissions and have large exhaust flowrates, resulting in very low concentrations of PM. Add-on control devices would not provide any measurable emission reduction.	**Applicant:** Included in RBLC for the control of PM emissions from large natural gas-fired lean-burn stationary internal combustion engines.	**Applicant:** Included in RBLC for the control of PM emissions from large natural gas-fired lean-burn stationary internal combustion engines.
Technically feasible?	**No**	**No**	**No**	**Yes**	**Yes**
Other	No	**Applicant:** Dry ESP efficiency varies significantly with dust resistivity. Air leakage and acid condensation may cause corrosion.	**Applicant:** Cyclones exhibit lower efficiencies when collecting smaller particles. High-efficiency units may require substantial pressure drop.	PM10/PM2.5 BACT Limit is **9.99E-03 lb/MMBtu** by implementing good combustion practices and use of pipeline quality natural gas. Limit will apply to all **Units C1-E to C10-E**. Pipeline quality natural gas is **5 gr total sulfur/100 scf** .	**AQB:** This approach goes in tandem with pipeline quality natural gas.
Evaluate Energy, Environment, Indirect economic	Applicant:	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
Economic analysis	**Applicant:** None provided. **AQB:** EPA has performed cost analyses procedures[a].	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
BACT Selection	**No**	**No**	**No**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Fabric Filter - Pulse-Jet Cleaned Type)," EPA-452/F-03-025.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Dry Electrostatic Precipitator (ESP) - Wire-Pipe Type)," EPA-452/F-03-027.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Dry Electrostatic Precipitator (ESP) - Wire-Plate Type)," EPA-452/F-03-028.

d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Wet Electrostatic Precipitator(ESP) - Wire-Pipe Type)," EPA-452/F-03-029.

e. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Cyclone)," EPA-452/F-03-005.

f. Pipeline quality natural gas is defined as gas having sulfur content of 5 gr/100 scf or less.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 5. Compressor Engine (RICE): Natural Gas Fired: PM-10/PM2.5 Condensable BACT (Units C1-E to C10-E)

	Control Technologies →→→			
	Thermal Incineration	**Catalytic Oxidation**[d]	**Pipeline Quality Natural Gas**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Oxidizes some particulate matter commonly composed as soot, which is formed as a result of incomplete combustion of hydrocarbons, by raising the temperature of the material above the auto-ignition point in the presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. Temp 1,100 - 1,200 °F[c] ; inlet flow 500 - 50,000 scfm[c] ; inlet PM concentration as low as 100 ppmv or less[b]	**Applicant:** Similar to thermal incineration; waste stream is heated by a flame and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. Temp 600 - 800 °F (not to exceed 1,250 °F); inlet flow 700 - 50,000 scfm; inlet PM concentration as low as 1 ppmv	**Applicant:** Combusting only natural gas, which has an inherently low sulfur content, rather than higher sulfur content fuels alone or in combination with natural gas.	**Applicant:** Operate and maintain the equipment in accordance with good air pollution control practices and with good combustion practices.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of condensable PM emissions from large natural gas-fired lean-burn stationary internal combustion engines.	**Applicant:** Not included in RBLC for the control of condensable PM emissions from large natural gas-fired lean-burn stationary internal combustion engines.	**Applicant:** Included in RBLC for the control of PM emissions from large natural gas-fired lean-burn stationary internal combustion engines.	**Applicant:** Included in RBLC for the control of PM emissions from large natural gas-fired lean-burn stationary internal combustion engines.
Technically feasible?	**No**	**Not for condensable PM**	**Yes**	**Yes**
Other	**Applicant, but wording modified by AQB:** Thermal oxidizers would not effectively reduce emissions of VOC from properly operated natural gas-fired stationary internal combustion engines that are already using a catalyst.	**Applicant:** Oxidation efficiency depends on exhaust flow rate and composition. Residence time required for oxidation to take place at the active sites of the catalyst may not be achieved if exhaust flow rates exceed design specifications. Also, sulfur and other compounds may foul the catalyst, leading to decreased efficiency. **Control Efficiency:** 25-99.9%	PM10/PM2.5 BACT Limit is **9.99E-03 lb/MMBtu** by implementing good combustion practices and use of pipeline quality natural gas. Limit will apply to all **Units C1-E to C10-E**. Pipeline quality natural gas is **5 gr total sulfur/100 scf** .	**AQB:** This approach goes in tandem with pipeline quality natural gas.
Evaluate Energy, Environment, Indirect economic	**Applicant:** Additional fuel is required to reach the ignition temperature of the waste gas stream. Oxidizers are not recommended for controlling gases with sulfur containing compounds because of the formation of highly corrosive acid gases[a].	**Applicant:** No specific removal rate is identified for natural gas combustion. Literature review found no studies of removal efficiencies achieved by catalytic oxidation for exhaust streams from natural gas combustion. The percent removal (if any) actually achieved on removal of organic condensable PM is not known. Regardless, engines will include an oxidation catalyst due to CO and VOC control requirements.	N/A, is BACT	N/A, is BACT
Economic analysis	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
BACT Selection	**No**	**Not for condensable PM**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Regenerative Incinerator)," EPA-452/F-03-021.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Recuperative Incinerator)," EPA-452/F-03-020.

d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 6. Compressor Engine (RICE): Natural Gas Fired: SO_2 BACT (Units C1-E to C10-E)

	Control Technologies →→→	
	Flue Gas Desulfurization[a]	**Pipeline Quality Natural Gas[b]**
Identified Air Pollution Control Technologies	**Applicant:** Absorption of SO2 is accomplished by the contact between the exhaust and an alkaline reagent, which results in the formation of neutral salts. Wet systems employ reagents using packed or spray towers and generate wastewater streams, while dry systems inject slurry reagent into the exhaust stream to react, dry and be removed downstream by particulate control equipment. Temps 300 - 700 °F (wet), 300 - 1,830 °F (dry). Typical inlet SO2 concentration 2,000 ppmv.	**Applicant:** Combusting only natural gas, which has an inherently low sulfur content, rather than higher sulfur content fuels alone or in combination with natural gas.
Feasibility Evaluations	**Applicant:** Wet systems may require flue gas re-heating downstream of the absorber to prevent corrosive condensation. Inlet streams for dry systems must be cooled as appropriate, and dry systems require use of particulate controls to collect the solid neutral salts. Not included in RBLC for the control of SO2 emissions for natural gas-fired stationary internal combustion engines.	**Applicant:** Included in RBLC for the control of SO2 from natural gas-fired stationary internal combustion engines.
Technically feasible?	**No**	**Yes**
Other	**Applicant:** Technology has not been applied to natural gas combustion engines due to very low SO2 and H2SO4 emissions. Controls would not provide any measurable emission reduction.	SO2 BACT Limit is **5 gr total sulfur/100 scf in the fuel inlet** by utilizing pipeline quality natural gas.
Evaluate Energy, Environment, Indirect economic	N/A not technically feasible	N/A is BACT
Economic analysis	N/A not technically feasible	N/A is BACT
BACT Selection	**No**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Flue Gas Desulfurization)," EPA-452/F-03-034.

b. Pipeline quality natural gas is defined as gas having sulfur content of 5 gr/100 scf or less.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 7. Compressor Engine (RICE): Natural Gas Fired: GHG BACT (Units C1-E to C10-E)

	Control Technologies →→→	
	Carbon Capture and Sequestration (CCS)	**Good Combustion Practices (GCP) using Pipeline Quality Natural Gas**
Identified Air Pollution Control Technologies	**Applicant:** For the engines, CCS would involve post combustion capture of the CO2 from the engines and sequestration of the CO2 in some fashion. **AQB:** CCS may be defined variously, through several steps, but first involves the capture of CO2 (that would otherwise be released to the atmosphere), transport (short or longer distance), then sequestration or storage in some location or form where it is prevented from entering the atmosphere. Sequestration could take various forms such as use of CO2 in other chemical processes or return for storage into vegetation. Geologic storage would be one form of sequestration where the CO2 is placed for long term storage in subsurface geological formations.[a, b, c, d]	**Applicant:** Operating practices to maintain fuel efficiency of the engines, proper maintenance and tune-up of engines at least annually per manufacturer's specifications. **AQB:** The applicant listed fuel selection (i.e., pipeline quality natural gas), air/fuel ratio, and efficient engine design (lean burn) as separate control technologies, but the AQB intends to combine all of these under good combustion practices per EPA guidance[e].
Feasibility Evaluations	**Applicant:** Carbon capture could be accomplished with low pressure scrubbing of CO2 from the exhaust stream with solvents (e.g., amines and ammonia), solid sorbents, or membranes. However, only solvents have been used to-date on a commercial (yet slip stream) scale. The use of solid sorbents and membranes are considered to be in the research and development phase.	**Applicant:** Engines will be tuned once per year, or more frequently, per manufacturer recommendations; CO2 and CO2e calculations performed monthly, using a 12-month rolling average, and high heat values of the fuel determined semi-annually (at minimum) per 40 CFR Part 98; fuel combusted in the engines measured and recorded using an operational non-resettable elapsed flow meter calibrated annually. **Limits will be as shown in the permit; 16,029 tpy (each) for Units C1-E to C8-E; and 10,101 tpy (each) for Units C9-E to C10-E.**
Technically feasible?	**No**	**Yes**
Other	**Applicant:** The engines emit CO2 in small and more diluted quantities. In addition, the CO2 concentration in the flue gas stream is approximately 4.6%. **AQB:** Agrees, that under present technologies, CCS is not the best control system for RICE engines.	**AQB: BACT will include all of the elements described above in feasibility.** DCP will implement BACT Limits for CO2e at **16,029 tpy** for engines **C1-E to C8-E**, and **10,101 tpy** for engines **C9-E to C10-E** (information provided by applicant and checked by AQB).
Evaluate Energy, Environment, Indirect economic	N/A, not technically feasible	N/A is BACT
Economic analysis	**Applicant:** The low purity and concentration of CO_2 in the engines' exhaust means that the per ton cost of removal and storage will be much higher than public data estimates for much larger carbon rich fossil fuel facilities due to the loss of economies of scale. Even using low-side published estimates for CO_2 capture and storage of $256 per ton for equipment with similar flue gas characteristics such as a new natural gas combined cycle turbine, assuming a conservative $6/MBtu gas price (Anderson, S., and Newell, R. 2003. Prospects for Carbon Capture and Storage Technologies. Resources for the Future. Washington DC) means added cost to the project over $42,059,654 per year, which adds a significant cost to the scope of the project.	N/A is BACT
BACT Selection	**No**	**Yes**

a. USEPA website: http://www.epa.gov/climatechange/ccs/index.html#Federal

b. The North American Carbon Storage Atlas (NACSA) 2012. www.nacsap.org

c. USEPA Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Storage (CO2) Geologic Sequestration Wells, Final Rule (40 CFR Parts 124, 144, 145, et al). Federal Register Vol. 75, No. 237, pgs. 77230-77303, Dec. 10, 2010.

d. Intergovernmental Panel on Climate Change (IPCC), 2005. Carbon Dioxide Capture and Storage. Cambridge University Press.

e. USEPA Guidance Document on Good Combustion Practices (find proper citation, DCP/Trinity provided this citation, but EPA appears to have moved it elsewhere).
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 8. Heaters: Natural Gas Fired: NOx BACT (Units H1, H3 to H6)

	Low NOx Burners[b]	Good Combustion Practices (GCP)
Identified Air Pollution Control Technologies	**Applicant:** NOx control from these burners is based on combustion modification techniques. Precise mixing of fuel and air is used to keep the flame temperature low and to dissipate heat quickly through the use of low excess air, off stoichiometric combustion and combustion gas recirculation. **The only change to BACT control requirements is for NOx for Heaters H4 and H5.** BACT for all other pollutants and the other heaters was not re-reviewed. The capacities of these units decreased from 114 MMBtu/hr to 99 MMBtu/hr. The BACT control in the PSD permit 5217 was Ultra Low NOx Burners. For this application it is Low NOx Burners. The AQB could find no difference between low and ultra low NOx burners. Also, the NOx BACT limits are staying the same.	**Applicant:** Minimize the formation of NOx during combustion through air-to-fuel ratio control, ignition timing reduction, and fuel quality analysis and fuel handling. **AQB:** GCP includes those items mentioned, including combustion temperature, but fuel handling applies more to variable composition fuels, rather than the pipeline quality natural gas that DCP will be using.
Feasibility Evaluations	**Applicant:** Included in RBLC for the control of NOx emissions from natural gas fired-heaters from > 10 MMBtu/hr to > 100 MMBtu/hr, but **NOT** for heaters < 10 MMBtu/hr. **AQB:** Again, the use of the word "low" by itself must be taken with caution, as RBLC does show the word "low" used for heaters < 10 MMBtu/hr. Rather, the reported emission limits are important.	**Applicant:** Included in RBLC for the control of NOx emissions from all natural gas fired-heaters (A**ll sizes**, < 10 MMBtu/hr to > 100 MMBtu/hr).
Technically feasible?	**Yes - for all**	**Yes - for all**
Other	**75-80%.** Is BACT for < 100 MMBtu/hr units**, which now includes all heaters**).	DCP will utilize pipeline quality natural gas. DCP will implement BACT Limits at: • **0.06 lb/MMBtu** (59.5 lb/MMscf) for heaters > 90 MMBtu/hr (**Units H4 and H5).** Subpart Db does not apply to heaters <100 MMBTU/hr. BACT for these 99 MMBTU/hr units is similar to the limits shown in the RBLC for heaters between 50 and 100 MMBTU/hr (average 0.05 lb/MMBTU) and meets the manufacturer's specs for this equipment); • **0.049 lb/MMBtu** (48.6 lb/MMscf) for all heaters < 90 MMBtu/hr (**Units H1, H3, and H6**). Application asked for limit of 0.49 for H3 and H6, but this is probably a typo and the RBLC for heaters < 10 MMBTU/hr age 2009 and newer supports leaving the limit the same as H1. RBLC for heaters between 50 and 10 MMBTU/hr with low NOx burners (H1) has 10 of 18 BACT limits in the 0.35-0.05 range, which supports this BACT. **Numeric emission limits for each unit remain unchanged from previous permit**
Evaluate Energy, Environment, Indirect economic	N/A is BACT for all heaters	N/A is BACT
Economic analysis	N/A is BACT	N/A is BACT
BACT Selection	**Yes- for all**	**Yes - for all**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Alternative Control Techniques Document -- NOx Emissions from Process Heaters (Revised)" EPA-453/R-93-034

b. U.S. EPA, Office of Air Quality Planning and Standards, "Technical Bulletin Nitrogen Oxides (NOx), Why and How They are Controlled" EPA 456/F-99-006R

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 9. Heaters: Natural Gas Fired: CO BACT (Units H1, H3 to H6)

	Control Technologies →→→	
	Catalytic Oxidation[a]	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Waste stream is heated by a flame and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. Temps 600 - 800 °F (not to exceed 1,250 °F); inlet flow 700 - 50,000 scfm; inlet CO concentration as low as 1 ppmv.	**Applicant:** Continued operation at the appropriate oxygen range and temperature to promote complete combustion and minimize CO formation.
Feasibility Evaluations	**Applicant:** Not listed in RBLC. Not implemented on heaters of this size.	**Applicant:** Included in RBLC for the control of CO emissions from natural gas fired-heaters (**All sizes**, < 10 MMBtu/hr to > 100 MMBtu/hr).
Technically feasible?	**Not sure - for 100 to 250 MMBtu/hr but not typically used;** **No - for units < 100 MMBtu/hr**	**Yes - for all**
Other	**Applicant:** Oxidation efficiency depends on exhaust flow rate and composition. Residence time required for oxidation to take place at the active sites of the catalyst may not be achieved if exhaust flow rates exceed design specifications.	DCP will utilize pipeline quality natural gas with BACT Limits of: • **0.041 lb/MMBtu** (40.6 lb/MMscf) for heaters > 90 MMBtu/hr (**Units H4 and H5**); • **0.082 lb/MMBtu** (81.6 lb/MMscf) for heaters < 90 MMBtu/hr (**Units H1, H3, and H6**).
	Not clear if technically feasible on large heaters, but this control would increase GHGs. CO for entire facility is already controlled 87%	
Evaluate Energy, Environment, Indirect economic	See economic information below	N/A is BACT
Economic analysis	**Applicant:** None provided. **AQB:** Based on the EPA document cited[a] , "As a rule, smaller units controlling a low concentration waste stream will be much more expensive (per unit volumetric flow rate) than a large unit cleaning a high pollutant load flow. Capital cost: \$47,000 to \$191,000 per sm^3/sec (\$22 to \$90 per scfm)" [a]	N/A is BACT
BACT Selection	**No**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 10. Heaters: Natural Gas Fired: VOC BACT (Units H1, H3 to H6)

	Control Technologies →→→	
	Catalytic Oxidation[a]	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Waste stream is heated by a flame and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. Temps 600 - 800 °F (not to exceed 1,250 °F); inlet flow 700 - 50,000 scfm; inlet VOC concentration as low as 1 ppmv.	**Applicant:** Continued operation at the appropriate oxygen range and temperature to promote complete combustion and minimize VOC formation.
Feasibility Evaluations	**Applicant:** Not listed in RBLC. Not implemented on heaters of this size.	**Applicant:** Included in RBLC for the control of VOC emissions from natural gas fired-heaters (**All sizes**, < 10 MMBtu/hr to > 100 MMBtu/hr).
Technically feasible?	**Not sure - for 100 to 250 MMBtu/hr units; and No - for units < 100 MMBtu/hr**	**Yes - for all**
Other	**Applicant:** Oxidation efficiency depends on exhaust flow rate and composition. Residence time required for oxidation to take place at the active sites of the catalyst may not be achieved if exhaust flow rates exceed design specifications.	DCP will utilize pipeline quality natural gas. The BACT Limit will be **0.0054 lb/MMBtu** (5.3 lb/MMscf) for all heaters: < 10 MMBtu/hr to > 100 MMBtu/hr (**Units H1, H3, H4, H5, and H6**)
	Not clear if technically feasible on large heaters, but this control would increase GHGs. VOCs for entire facility is already controlled 78%	
Evaluate Energy, Environment, Indirect economic	See economic information below	N/A is BACT
Economic analysis	**Applicant:** None provided. **AQB:** Based on the EPA document cited[a] , "As a rule, smaller units controlling a low concentration waste stream will be much more expensive (per unit volumetric flow rate) than a large unit cleaning a high pollutant load flow. Capital cost: \$47,000 to \$191,000 per sm^3/sec (\$22 to \$90 per scfm)" [a]	N/A is BACT
BACT Selection	**No**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 11. Heaters: Natural Gas Fired: PM-10/PM-2.5 Filterable BACT (Units H1, H3 to H6)

	Control Technologies →→→			
	Electrostatic Precipitator (ESP)[a, b, c]	**Cyclone**[d]	**Pipeline Quality Natural Gas**[e]	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Electrodes stimulate the waste gas and induce an electrical charge in the entrained particles. The resulting electrical field forces charged particles to collector walls from which the material may be mechanically dislodged and collected in dry systems or washed with water deluge in wet systems. Up to 1,300 °F (dry), Lower than 170 - 190 °F (wet); inlet flow 1,000 - 100,000 scfm (Wire-Pipe), 100,000 - 1,000,000 scfm (Wire-Plate); inlet PM concentration 0.5 - 5 gr/dscf (Wire-Pipe), 1 - 50 gr/dscf (Wire-Plate)	**Applicant:** Centrifugal forces drive particles in the gas stream toward the cyclone walls as the waste gas flows through the conical unit. The captured particles are collected in a material hopper below the unit. Up to 1,000 °F; inlet flow 1.1 - 63,500 scfm (single) up to 106,000 scfm (in parallel); inlet PM concentration 0.44 - 7,000 gr/dscf	**Applicant:** Use of pipeline quality natural gas results in lower emissions.	Operate and maintain the equipment in accordance with good combustion practices.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of PM emissions for natural gas-fired heaters (of all sizes, < 10 MMBtu/hr to > 100 MMBtu/hr). "Natural-gas fired internal combustion engines generate low PM emissions and have large exhaust flowrates, resulting in very low concentrations of PM. Add-on control devices would not provide any measurable emission reduction."	**Applicant:** Not included in RBLC for the control of PM emissions for natural gas-fired heaters (of all sizes, < 10 MMBtu/hr to > 100 MMBtu/hr). "Natural-gas fired internal combustion engines generate low PM emissions and have large exhaust flowrates, resulting in very low concentrations of PM. Add-on control devices would not provide any measurable emission reduction."	**Applicant:** Included in RBLC for the control of PM emissions from natural gas fired-heaters (of all sizes, < 10 MMBtu/hr to > 100 MMBtu/hr).	**Applicant:** Included in RBLC for the control of PM emissions from natural gas fired-heaters (of all sizes, < 10 MMBtu/hr to > 100 MMBtu/hr).
Technically feasible?	**No**	**No**	**Yes**	**Yes**
Other	**Applicant:** Dry ESP efficiency varies significantly with dust resistivity. Air leakage and acid condensation may cause corrosion.	**Applicant:** Cyclones typically exhibit lower efficiencies when collecting smaller particles. High-efficiency units may require substantial pressure drop. **AQB:** PM emissions from natural gas fuel are mostly, if not all, comprised of PM2.5 and smaller. Cylcones are not effective on this size of PM.	BACT is pipeline quality natural gas defined as **5 gr S/100 scf in the fuel inlet**.	The BACT Limit will be **0.0075 lb/MMBtu** (7.4 lb/MMscf) for all heaters: < 10 MMBtu/hr to > 100 MMBtu/hr (**Units H1, H3, H4, H5, and H6**)
Evaluate Energy, Environment, Indirect economic	**Applicant:** Equipment footprint is often substantial.	N/A not technically feasible	N/A is BACT	N/A is BACT
Economic analysis	N/A not technically feasible	N/A not technically feasible	N/A is BACT	N/A is BACT
BACT Selection	**No**	**No**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Dry Electrostatic Precipitator (ESP) - Wire-Pipe Type)," EPA-452/F-03-027.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Dry Electrostatic Precipitator (ESP) - Wire-Plate Type)," EPA-452/F-03-028.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Wet Electrostatic Precipitator(ESP) - Wire-Pipe Type)," EPA-452/F-03-029.

d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Cyclone)," EPA-452/F-03-005.

e. Pipeline quality natural gas is defined as gas having sulfur content of 5 gr/100 scf or less.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 12. Heaters: Natural Gas Fired: PM-10/PM-2.5 Condensable BACT (Units H1, H3 to H6)

	Control Technologies →→→			
	Thermal Incineration[a]	**Catalytic Oxidation[c]**	**Pipeline Quality Natural Gas**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Oxidizes some particulate matter commonly composed as soot, which is formed as a result of incomplete combustion of hydrocarbons, by raising the temperature of the material above the auto-ignition point in the presence of O2 and maintaining the high temp for sufficient time to complete combustion. Temp 1,100 - 1,200 °F ; inlet flow 500 - 50,000 scfm ; inlet concentration as low as 100 ppmv or less[b]. **AQB:** The 100 ppmv is for VOC or CO. Applicant obtained this number from regenerative incinerator document and as stated in this document[b] PM is not a listed controlled pollutant, further, condensables clog and poison catalysts (if used). Hence the 100 ppmv figure supplied for PM is not verifiable.	**Applicant:** Similar to thermal incineration; waste stream is heated by a flame and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. Temp 600 - 800 °F (not to exceed 1,250 °F); inlet flow 700 - 50,000 scfm; inlet PM concentration as low as 1 ppmv	**Applicant:** Use of pipeline quality natural gas results in lower emissions. **AQB:** Combust only pipeline quality natural gas, which has an inherently low sulfur content to begin with.	Operate and maintain the equipment in accordance with good combustion practices.
Feasibility Evaluations	**Applicant:** Not listed in RBLC. Not implemented on heaters of this size. **AQB:** The RBLC results indicate this control technology not used on heaters < 250 MMBtu/hr.	**Applicant:** Not listed in RBLC. Not implemented on heaters of this size. **AQB:** The RBLC results indicate this control technology not used on heaters < 250 MMBtu/hr.	**Applicant:** Included in RBLC for the control of PM emissions from natural gas fired-heaters (of all sizes, < 10 MMBtu to > 100 MMBtu/hr).	**Applicant:** Included in RBLC for the control of PM emissions from natural gas fired-heaters (of all sizes, < 10 MMBtu to > 100 MMBtu/hr).
Technically feasible?	**No**	**No**	**Yes**	**Yes**
Other	**Applicant:** Thermal oxidizers do not reduce emissions of condensable PM from properly operated natural gas combustion units without the use of a catalyst.	**Applicant:** Oxidation efficiency depends on exhaust flow rate and composition. Residence time required for oxidation to take place at the active sites of the catalyst may not be achieved if exhaust flow rates exceed design specifications. Not proven as a condensable PM emission control device.	BACT is pipeline quality natural gas defined as **5 gr S/100 scf in the fuel inlet**.	BACT is **0.0075 lb/MMBtu** (7.4 lb/MMscf) for all heaters: < 10 MMBtu/hr to > 100 MMBtu/hr (**Units H1, H3, H4, H5, and H6**) using good combustion practices
Evaluate Energy, Environment, Indirect economic	**Applicant:** Additional fuel is required to reach the ignition temperature of the waste gas stream.	N/A not technically feasible	N/A is BACT	N/A is BACT
Economic analysis	N/A not technically feasible	N/A not technically feasible	N/A is BACT	N/A is BACT
BACT Selection	**No**	**No**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Regenerative Incinerator)," EPA-452/F-03-021.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 13. Heaters: Natural Gas Fired: SO_2 BACT (Units H1, H3 to H6)

	Control Technology
	Pipeline Quality Natural Gas
Identified Air Pollution Control Technologies	**Applicant:** Use of pipeline quality natural gas results in lower emissions. **AQB:** Combust only pipeline quality natural gas, which has an inherently low sulfur content to begin with.
Feasibility Evaluations	**Applicant:** Included in RBLC for the control of SO2 emissions from natural gas fired heaters (all sizes < 10 MMBtu/hr to > 100 MMBtu/hr).
Technically feasible?	**Yes**
Other	BACT is pipeline quality natural gas defined as **5 gr S/100 scf in the fuel inlet**.
BACT Selection	**Yes**

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 14. Heaters: Natural Gas Fired: GHG BACT (Units H1, H3 to H6)

	Control Technologies →→→	
	Carbon Capture and Sequestration (CCS)	**Good Combustion Practices (GCP) using Pipeline Quality Natural Gas**
Identified Air Pollution Control Technologies	**Applicant:** For the heaters, CCS would involve post combustion capture of the CO2 from the engines and sequestration of the CO2 in some fashion. **AQB:** CCS may be defined variously, through several steps, but first involves the capture of CO2 (that would otherwise be released to the atmosphere), transport (short or longer distance), then sequestration or storage in some location or form where it is prevented from entering the atmosphere. Sequestration could take various forms such as use of CO2 in other chemical processes or return for storage into vegetation. Geologic storage would be one form of sequestration where the CO2 is placed for long term storage in subsurface geological formations.[a, b, c, d]	**Applicant:** Operating practices to maintain fuel efficiency of the heaters, proper maintenance and tune-up of heaters at least annually per manufacturer's specifications. **AQB:** fuel selection (i.e., pipeline quality natural gas), efficient heater design (including air/fuel ratio and intelligent flame controls), and heat integration (heat transfer) are part of good combustion practices per EPA guidance[e].
Feasibility Evaluations	**Applicant:** Carbon capture could be accomplished with low pressure scrubbing of CO2 from the exhaust stream with solvents (e.g., amines and ammonia), solid sorbents, or membranes. However, only solvents have been used to-date on a commercial (yet slip stream) scale. The use of solid sorbents and membranes are considered to be in the research and development phase. CCS has not been tested or demonstrated for small combustion sources.	**Applicant:** CO2 and CO2e calculations performed monthly, using a 12-month rolling average per 40 CFR Part 98. **AQB:** Heater Units H4, and H5 individually and collectively emit much more CO2e than the RICE engines (these 2 heaters account for 30% of all CO2e emitted by facility equipment). Hence, **heaters (H4 and H5)** shall be tuned once per year, or more frequently, per manufacturer recommendations; high heat values of the fuel shall be determined semi-annually (at minimum); and fuel combusted in the heaters measured and recorded using an operational non-resettable elapsed flow meter calibrated annually. DCP has agreed to these practices. **BACT Limits for CO2e will be 117 lb/MMBtu (115,623 lb/MMscf) for all heaters H1 to H6.**
Technically feasible?	**No**	**Yes**
Other	**Applicant:** The engines emit CO2 in small quantities. **AQB:** Agrees, that under present technologies, CCS is not the best control system for heaters.	**AQB: BACT will include all of the elements described above in Step 2.** DCP will implement BACT Limits for CO2e at **117 lb/MMBtu (115,623 lb/MMscf)** for all heaters **H1 to H6** (information provided by applicant and checked by AQB).
Evaluate Energy, Environment, Indirect economic	N/A not technically feasible	N/A is BACT
Economic analysis	N/A not technically feasible	N/A is BACT
BACT Selection	**No**	**Yes**

a. USEPA website: http://www.epa.gov/climatechange/ccs/index.html#Federal

b. The North American Carbon Storage Atlas (NACSA) 2012. www.nacsap.org

c. USEPA Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Storage (CO2) Geologic Sequestration Wells, Final Rule (40 CFR Parts 124, 144, 145, et al). Federal Register Vol. 75, No. 237, pgs. 77230-77303, Dec. 10, 2010.

d. Intergovernmental Panel on Climate Change (IPCC), 2005. Carbon Dioxide Capture and Storage. Cambridge University Press.

e. USEPA Guidance Document on Good Combustion Practices (find proper citation, DCP/Trinity provided this citation, but EPA appears to have moved it elsewhere).
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 15. Amine Sweetening Still Vent: VOC BACT (Unit Amine)

	Control Technologies →→→	
	Catalytic/Thermal Oxidation	**Acid Gas Injection (AGI)**
Identified Air Pollution Control Technologies	**Applicant:** This control option is similar to thermal incineration where the waste stream is heated by a flame and is then passed through a catalyst bed that increases the oxidation rate.	**Applicant:** This control option injects the acid gas still vent stream from the amine unit into a Class II well regulated by New Mexico's Oil Conservation Division (NMOCD). AGI stores the acid gas in an isolated subsurface reservoir. The acid gas stream would include all entrained VOC from the amine unit as well.
Feasibility Evaluations	**Applicant:** Feasible.	**Applicant:** There are a number of Class II injection wells in New Mexico, which is a good indication of availability and consequently, implementation of AGI for this project.
Technically feasible?	**Yes, but AGI coupled with flaring is a better control**	**Yes**
Other	**Applicant:** This control option offers 98% control of VOC emissions. **AQB:** Acid gas injection is also being used as BACT for greenhouse gases (GHG). AQB agrees that implementing acid gas injection jointly for VOC and GHG makes more practical sense than using catalytic or thermal oxidation for VOC.	**Applicant:** This control option offers 100% control of emissions. **AQB:** Class II wells are designed to protect ground water resources. NMOCD regulations on Class II wells are thorough with the intent to geologically sequester acid gases[a,b,c,d] . Current knowledge of subsurface geologic features, the types of layers and potential existence of fractures is implemented in the determination of ground water protection, and 100% entrapment of acid gases is the intended goal. Examples specifically for New Mexico exist (Linum Ranch and Jal#3)[d] and there is a body of knowledge that existing UIC programs are existing and available[a,b,c,d,e,f] . **BACT will be Class II acid gas injection wells (AGI). The acid gas flare (FL2) will serve as secondary BACT for SSM and will be subject to 40 CFR 60.18 requirements.**
Evaluate Energy, Environment, Indirect economic	N/A Acid gas injection combined with flaring is a better control method and also controls GHGs and H2S.	N/A is BACT
Economic analysis	N/A	N/A is BACT
BACT Selection	**No**	**Yes**

a. Title 19, Chapter 5, Part 26, Oil and Gas Injection (19.15.26 NMAC).

b. Class II Well Facts: New Mexico's Underground Injection Control (UIC) Program, NMEMNRD, Oil Conservation Division (OCD).

c. "A Blueprint for the Regulation of Geologic Sequestration of Carbon Dioxide in New Mexico," NMEMNRD, Pursuant to Executive Order 2006-69. Fesmire, Rankin, Brooks, and Jones. Dec. 1, 2007

d. Chapter 1: Acid Gas Injection in the Permian and San Juan Basins: Recent Case Studies from New Mexico. Lescinsky, A. Gutierrez, Hunter, J. Gutierrez, and Bentley (of Geolux, Inc, and Carbon Free Corp), 2nd International Acid Gas Injection Symposium, Calgary, Sept. 27-30, 2010. 29 pgs.

e. Intergovernmental Panel on Climate Change (IPCC), 2005. Carbon Dioxide Capture and Storage. Cambridge University Press.
f. The North American Carbon Storage Atlas (NACSA) 2012. www.nacsap.org

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 16. Amine Sweetening Still Vent: GHG BACT (Unit Amine)

	Control Technologies →→→			
	Combustion (Flares or Thermal Oxidizers)	**Proper Design and Operation**	**Flash Tank Off-Gas Recovery System**	**Acid Gas Injection (AGI) (as CCS method)**
Identified Air Pollution Control Technologies	**Applicant:** Flares and combustors are examples of control devices in which the control of certain pollutants causes the formation of collateral GHG emissions.	**Applicant:** The amine unit will be a brand new, state of the art equipment installed on site. The amine unit will operate at an optimal circulation rate with consistent amine concentrations.	**Applicant:** The amine unit will be equipped with a flash tank. The flash tank emissions will be recycled into the plant for reprocessing, instead of venting to the atmosphere or combustion device.	**Applicant:** This control option injects the acid gas still vent stream from the amine unit into a Class II well regulated by New Mexico's Oil Conservation Division (NMOCD). AGI stores the acid gas in an isolated subsurface reservoir. AGI wells are designed to accept CO2 as well as other acid gases from sour gas processing streams, such as amine still vent streams that are rich in H2S.
Feasibility Evaluations	**Applicant:** The control of CH4 in the process gas at the flare or combustor results in the creation of additional CO2 emissions via the combustion reaction mechanism.	**Applicant:** By optimizing the circulation rate, the amine unit avoids pulling out additional GHGs in the amine streams, which would increase GHG emissions into the atmosphere. **AQB:** Too slow circulation could absorb some CH4 in amine stream, but CH4 will be flashed back to the process (see next column on tank off-gas).	**Applicant:** Feasible. **AQB:** This is considered an initial recovery of potential emissions. Absorbed CH4 is expected to flash-off back to the process.	**Applicant:** There are a number of Class II injection wells in New Mexico, which is a good indication of availability and consequently, implementation of AGI for this project. The facility will operate two AGI units. The applicant also discussed enhanced oil recovery (EOR) within the context of CCS. **AQB:** Agrees with the feasibility of AGI (see discussion in boxes below).
Technically feasible?	**Yes - as backup to AGI**	**Yes**	**Yes**	**Yes**
Other	**AQB:** Control of any CH4, via conversion to CO2, although creating additional GHG, CO2 is of lesser concern than CH4 since the global warming potential for CH4 is 25. AQB agrees that AGI (acid gas injection) will be more effective. Further, DCP will utilize an acid gas flare as back-up to AGI.	Yes	**Applicant:** The use of flash tanks increases the effectiveness of other downstream control devices.	**Applicant:** This control option offers 100% control of emissions. **AQB:** Class II wells are designed to protect ground water resources. NMOCD regulations on Class II wells are thorough with the intent to geologically sequester CO2 (more discussion below). Current knowledge of subsurface geologic features, the types of layers and potential existence of fractures is implemented in the determination of ground water protection, and 100% entrapment of acid gases is the intended goal. **Applicant also provided:** The AGI will inject into the Delaware Mountain Group, represented by transitional Bell and Cherry Canyon limestone and sandstone, and underlying Brushy Canyon sandstone. Brushy Canyon is underlain by upper Bone Spring limestone. The proposed AGI potential injection zone falls specifically within the lower 200 ft of the Cherry Canyon Member and the upper 400 ft of the Brushy Canyon Member. A subsurface safety valve (SSV) will be placed approximately 200 ft below the surface. The surface casing will be at a depth of approximately 700 ft. After pressure testing and cement bond logging, the intermediate casing will be set at approximately 2,700 ft. The final production casing will be set at approximately 6,100 ft.

Table 16, cont.

	Control Technologies →→→			
	Combustion (Flares or Thermal Oxidizers)	**Proper Design and Operation**	**Flash Tank Off-Gas Recovery System**	**Acid Gas Injection (AGI) (as CCS method)**
Evaluate Energy, Environment, Indirect economic	**AQB:** The acid gas flare, to be used as a control device when AGI is down for maintenance, is also intended to provide 98% control of H2S emissions, a state regulated air pollutant. **The acid gas flare (FL2) will serve as secondary BACT for SSM and will be subject to 40 CFR 60.18 requirements.**	N/A is BACT	N/A is BACT	**Applicant:** The additional processing required[h] for injection in a Class VI well with regards to separating out the CO2 portion is not required for a Class II well which saves energy as well as reduces other pollutants such as H2S and VOC associated with the emission source. **AQB:** The most recently created Class VI system is designed for larger and purer CO2 streams[g] . AQB considers Class II wells an existing and readily accessible form of CCS for this type of facility. Study of geologic sequestration methods have been on-going for years, and continue with much yet to be learned from experience and practical implementation. Tracer studies would be the most definitive for determining control efficiency (i.e., that acid gases do not get pulled out via another well operation), but these have been primarily implemented in research studies[e] . Class II wells are designed to protect ground water resources. NMOCD regulations on Class II wells are thorough with the intent to geologically sequester acid gases[a,b,c,d] . Current knowledge of subsurface geologic features, the types of layers and potential existence of fractures is implemented in the determination of ground water protection, and 100% entrapment of acid gases is the intended goal. Examples specifically for New Mexico exist (Linum Ranch and Jal#3)[d] and there is a body of knowledge that existing UIC programs are existing and available[a,b,c,d,f] . **BACT will be Class II acid gas injection wells (AGI).**
Economic analysis	N/A is BACT	N/A is BACT	N/A is BACT	N/A is BACT

BACT Selection	**Yes - as AGI Flare for SSM**	**Yes**	**Yes**	**Yes**

a. Title 19, Chapter 5, Part 26, Oil and Gas Injection (19.15.26 NMAC).

b. Class II Well Facts: New Mexico's Underground Injection Control (UIC) Program, NMEMNRD, Oil Conservation Division (OCD).

c. "A Blueprint for the Regulation of Geologic Sequestration of Carbon Dioxide in New Mexico," NMEMNRD, Pursuant to Executive Order 2006-69. Fesmire, Rankin, Brooks, and Jones. Dec. 1, 2007

d. Chapter 1: Acid Gas Injection in the Permian and San Juan Basins: Recent Case Studies from New Mexico. Lescinsky, A. Gutierrez, Hunter, J. Gutierrez, and Bentley (of Geolux, Inc, and Carbon Free Corp), 2nd International Acid Gas Injection Symposium, Calgary, Sept. 27-30, 2010. 29 pgs.

e. Intergovernmental Panel on Climate Change (IPCC), 2005. Carbon Dioxide Capture and Storage. Cambridge University Press.

f. The North American Carbon Storage Atlas (NACSA) 2012. www.nacsap.org

g. Federal Requirements Under the Underground (UIC) Program for Carbon Dioxide (CO2) Geologic Sequestration (GS) Wells; Final Rule. 40 CFR Parts 124, 144, 145, et al. FR Vol 75, No. 237, pgs 77230-77303, Dec. 10, 2010.

h. National Energy Technology Laboratory (NETL), Estimating Carbon Dioxide Transport and Storage Costs. DOE/NETL-2010/1447, March, 2010.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 17. TEG Dehydrator Still Vent: VOC BACT (Unit Dehy)

	Control Technologies →→→		
	Catalytic/Thermal Oxidation[a]	**Thermal Incineration[b] (VCD)**	**Condenser[c]**
Identified Air Pollution Control Technologies	**Applicant:** Similar to thermal incineration; waste stream is heated by a flame and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. Temp 600 - 800 °F (not to exceed 1,250 °F); inlet flow 700 - 50,000 scfm; inlet PM concentration as low as 1 ppmv	**Applicant:** A closed flame control device like a VCD (Vapor Combustion Device) used for disposing of waste gas streams. Temp 1,100 - 1,200 °F ; inlet flow 500 - 50,000 scfm ; inlet VOC concentrations 1500-3000 ppmv.	**Applicant:** Condensers are supplemental emissions control devices that reduce the temperature of the still column vent vapors on dehydration units to condense water and VOC. They are frequently used prior to control devices.
Feasibility Evaluations	**Applicant:** Included in RBLC for the control of VOC emissions. However, DCP has safety concerns with thermal oxidation of high Btu content streams such as that of the dehydrator still vent. Unsafe explosions have occurred at other facilities, and DCP considers thermal oxidation technically infeasible for this process.	**Applicant:** Included in RBLC for the control of VOC emissions from dehydrator units.	**Applicant:** Included in RBLC for the control of VOC emissions from dehydrator units.
Technically feasible?	**Not Feasible due to safety concerns**	**Yes**	**Yes**
Other	**Applicant:** 98%. Catalyst can be deactivated by certain catalyst poisons or other fouling contaminants such as silicone, sulfur, heavy hydrocarbons, and particulates[a].	**Applicant:** 99% for certain compounds with up to three carbons, 98% otherwise. The dehydrator will also have a flash tank separator for recycling flash gases back to inlet compression. **AQB:** DCP will implement a VCD unit in conjunction with a condenser as BACT. The dehydrator will have no emissions.	**Applicant:** 80% **AQB:** Recently promulgated NSPS OOOO requirements for standards and monitoring for equipment leaks for VOC will apply to the dehydrator system and its components, including the condenser.
Evaluate Energy, Environment, Indirect economic	N/A not technically feasible	N/A is BACT	N/A is BACT
Economic analysis	N/A not technically feasible	N/A is BACT	N/A is BACT
BACT Selection	**No**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

c. U.S. EPA, Air Pollution Control Cost Manual - Sixth Edition (EPA 452/B-02-001), Chapter 2.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 18. TEG Dehydrator Still Vent: GHG BACT (Unit Dehy)

	[a]Control Technologies →→→			
	Combustor or Thermal Oxidizer (VCD)	**Proper Design and Operation**	**Tank Off-Gas Recovery System**	**Condenser**
Identified Air Pollution Control Technologies	**Applicant:** Vent gases go to a flare or a combustor, devices in which control of certain pollutants causes the formation of collateral GHG emissions. The control of CH4 in the process gas at the flare or combustor results in the creation of additional CO2 emissions via the combustion reaction mechanism.	**Applicant:** The dehydrator will be a brand new, state of the art equipment installed on site. The dehydrator will operate at an optimal circulation rate.	**Applicant:** The dehydrator will be equipped with a flash tank. The flash tank will be used to recycle the off-gases back into the plant for reprocessing, instead of venting to the atmosphere or combustion device.	**Applicant:** Condensers are supplemental emissions control that reduces the temperature of the still column vent vapors on dehydrators to condense water and VOCs, including CH4. The condensed liquids are then collected for further treatment or disposal.
Feasibility Evaluations	**Applicant:** Given the relative GWPs of CO2 and CH4 and the destruction of VOCs and HAPs, it is appropriate to apply combustion controls to CH4 emissions even though it will form additional CO2 emissions. **AQB:** VCD is the final (or tertiary) control device.	**Applicant:** By optimizing the circulation rate, the dehydrator avoids pulling out additional GHGs in the glycol stream, which would increase GHG emissions into the atmosphere. **AQB:** Too slow circulation could absorb more CH4 in glycol stream, but CH4 will be flashed back to the process (see next column on tank off-gas)	**Applicant:** Feasible. **AQB:** This is considered an initial recovery of potential emissions. Absorbed CH4 is expected to flash-off back to the process.	**Applicant:** Feasible. The condenser will remove VOC, BTEX compounds, as well as CH4. The BTEX condenser then routes to the VCD (primary control device) for further control. **AQB:** Condenser (a secondary control device) and the VCD work together as control devices (VCD being the final control device).
Technically feasible?	**Yes**	**Yes**	**Yes**	**Yes**
Other	**Applicant:** In general, flares and combustors have a destruction efficiency rate (DRE) of 98% (thermal oxidizers [TO] at 99%), resulting in minor CH4 emissions from the process flare due to incomplete combustion of CH4. DCP proposed BACT Limit for uncontrolled portion of TEG Dehy vent stream of 0.1074 lb CO2e/MMscf (wet) based on 230 MMscfd facility gas flow. **AQB:** This is 4.5 tpy of CO2e emissions from CO2 and 1% non-combustion of methane.	Applicant:	**Applicant:** The use of flash tanks increases the effectiveness of other downstream control devices.	**Applicant:** The reduction efficiency of the condensers is variable and depends on the type of condenser and the composition of the waste gas, ranging from 50-98% of the CH4 emissions in the waste gas stream.
Evaluate Energy, Environment, Indirect economic	N/A is BACT	N/A is BACT	N/A is BACT	N/A is BACT
Economic analysis	N/A is BACT	N/A is BACT	N/A is BACT	N/A is BACT
BACT Selection	**Yes**	**Yes**	**Yes**	**Yes**

a. Applicant also listed CCS, but since the CO2 concentration in vent stream is much lower than even RICE or heaters, so not discussed further.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 19. Tanks (Condensate and Produced Water): VOC BACT (Units TK-2100, TK-2200, TK-C, TK-6100, and TK-6150)

	Control Technologies →→→	
	Thermal Incineration[a]	**Fixed Roof, Submerged Fill, and Blanket Gas**
Identified Air Pollution Control Technologies	**Applicant:** Vent tanks to a closed flame control device like a VCD (Vapor Combustion Device) used for disposing of waste gas streams. Temp 1,100 - 1,200 °F ; inlet flow 500 - 50,000 scfm ; inlet VOC concentrations 1500-3000 ppmv.	**Applicant:** Fixed roof. Filling tanks via a submerged fill pipe and equipping tanks with a blanket gas that resides above the condensate and helps contain fugitive vapors. Tanks then ultimately vented to vapor combustion device (see left column).
Feasibility Evaluations	**Applicant:** Included in RBLC for the control of VOC emissions from storage tanks. **AQB:** Although RBLC results for tank VOC control did display results for closed flame combustion (to VCD), contrastingly, the applicant's discussion of the VCD (see Table 21) stated RBLC results for flares were used for comparison. Flares are open flame. DCP has since corrected and clarified the reference, meaning that the VCD will be an enclosed flame device.	**Applicant:** Included in RBLC for the control of VOC emissions from storage tanks.
Technically feasible?	**Yes**	**Yes**
Other	**Applicant:** 99% for certain compounds with up to three carbons, 98% otherwise. **AQB:** DCP will implement a VCD unit as BACT. The tanks will have no emissions. Because the condensate tanks (**TK-2100 and TK-2200**) will be vented to and controlled via the VCD unit, they will be below applicability thresholds of tank standards in NSPS OOOO. Nevertheless, the 500 ppm leak detection requirement for fugitives (60.5400) applies. The produced water tanks (**TK-C, TK-6100, TK-6150**), with PTE calculations below OOOO thresholds, will also be vented to the VCD, as they are not exempt from PSD. DCP has stated all tanks will achieve 98% efficiency as BACT (via the VCD) since 2% of VOCs are not combusted.	
Evaluate Energy, Environment, Indirect economic	N/A is BACT	N/A is BACT
Economic analysis	N/A is BACT	N/A is BACT
BACT Selection	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 20. Truck Load-out of Condensate Tanks: VOC BACT (Unit L1)

	Control Technologies →→→		
	Thermal Incineration[a]	**Submerged Fill**	**Pipeline Transfer**
Identified Air Pollution Control Technologies	**Applicant:** Vent fugitive emissions to a closed flame control device like a VCD (Vapor Combustion Device) used for disposing of waste gas streams. Temp 1,100 - 1,200 °F ; inlet flow 500 - 50,000 scfm ; inlet VOC concentrations 1500-3000 ppmv.	**Applicant:** Filling trucks via a submerged fill pipe will help reduce fugitive vapors.	**Applicant:** Material is transferred from the facility via pipeline thereby preventing any loading emissions.
Feasibility Evaluations	**Applicant:** Included in RBLC for the control of VOC emissions from truck load-out. **AQB:** Although RBLC results for truck load-out VOC control did display results for closed flame combustion (to VCD), contrastingly, the applicant's discussion of the VCD (see Table 21) stated RBLC results for flares were used for comparison. Flares are open flame. DCP has since clarified the reference, meaning that the VCD will be an enclosed flame device.	**Applicant:** Included in RBLC for the control of VOC emissions from truck loading.	**Applicant:** Not included in RBLC for the control of VOC emissions from truck loading.
Technically feasible?	**Yes**	**Yes**	**Yes**
Other	**Applicant:** 99% for certain compounds with up to three carbons, 98% otherwise. **AQB:** DCP will implement a VCD unit as BACT. Because of VCD use, truck loading VOC emissions are zero. Fugitives from the Truck loading would fall under facility-wide fugitives subject to NSPS OOOO with 500 ppm leak detection requirement for fugitives (60.5400). Although zero emissions are reported, DCP has stated truck loading will achieve 98% efficiency as BACT, meaning 2% of VOCs are not combusted		**Applicant:** 100% control since no VOC emissions from loading losses.
Evaluate Energy, Environment, Indirect economic	N/A is BACT	N/A is BACT	see economic analysis below
Economic analysis	N/A is BACT	N/A is BACT	**Applicant:** Typically not cost effective if infrastructure is not in place. Removal of condensate through a pipeline is not feasible at this time because the cost to DCP for each mile of pipeline is approximately $150,000 per mile. The closest pipeline to which DCP can route the condensate is approximately 17 miles away. Therefore, this adds a total of $2,550,000 for the pipeline addition. For a total VOC control of 111 tpy, this equates to roughly $23,000/ton VOC controlled. Therefore, at this time removal of condensate through a pipeline is considered economically infeasible.
BACT Selection	**Yes**	**Yes**	**No**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 21. Vapor Combustion Device: Natural Gas Pilot plus VOC Treatment: NOx, CO, VOC, and GHG BACT (Unit VCD1)

	Control Technologies →→→	
	Pipeline Quality Natural Gas[a]	**Good Combustion, Operating, and Maintenance Practices (for all criteria pollutants)**
Identified Air Pollution Control Technologies	**Applicant:** Use of natural gas as fuel results in low GHG emissions due to the lower carbon intensity of the fuel. **AQB:** The applicant identified this method as BACT only for GHG. AQB disagrees. Yes, natural gas is lower in carbon intensity than say oil, less CO_2 emissions, but if the combustion device were not operating properly, or if there was any leak in the inlet fuel line, since natural gas is mostly CH_4, GHG emissions could be worse. AQB also considers natural gas as BACT for VOC and CO emissions as well, not just GHG. Hence the applicant's rationale was incomplete.	**Applicant:** Good combustion and operating practices are a potential control option for improving the combustion efficiency of the vapor combustion device (VCD). Good combustion practices include proper operation and design, maintenance, and tune-up of the VCD at least annually per the manufacturer's specifications. The VCD is a unit that is used to control emissions of VOC from the glycol dehydrator still vent, condensate storage tanks, produced water tanks, and truck loading operations. In addition to incomplete combustion emissions, additional emissions of VOC result from the un-destructed portion of the vent streams.
Feasibility Evaluations	**Applicant:** Included in RBLC. **AQB:** The applicant stated the RBLC search applied flare results as being similar to a VCD. DCP has corrected and clarified the reference, meaning that the VCD will be an enclosed flame device.	**Applicant:** Included in RBLC. **AQB:** The applicant stated the RBLC search applied flare results as being similar to a VCD. They did not provide a search for "thermal incinerators" or "incinerators" unless the vapor combustion device will be a boiler (see RBLC results for heaters in the application). DCP has indicated in portions of the application that this device could be a boiler (provided AP-42 boiler emission factors), but in other places could be a thermal incinerator such as an oxidizer. DCP clarified the reference, meaning that the VCD will be an enclosed flame device.
Technically feasible?	**Yes**	**Yes**
Other	**Applicant:** Base case.	**BACT Limits** for several pollutants are as follows: **NOx: 0.098 lb/MMBtu; CO: 0.082 lb/MMBtu; VOC: 0.21 lb/MMBtu (at 98% control of VOC); CO2e: 117 lb/MMBtu.** CO_2 and CO_2e calculations performed monthly, using a 12-month rolling average per 40 CFR Part 98. The VCD shall be tuned and maintained per manufacturer specifications and/or recommendations; a fuel flowmeter will record fuel combusted in the VCD; high heat values will be tracked, an extended gas analysis will be run, and each month demonstrate compliance with the emission limits (pph and lb/MMBtu). The VCD being a control device, with several closed vent systems being routed to it (condensate and produced water tanks, dehydrator, and truck loadout), hence it is subject to the BACT floor in NSPS OOOO with a required control efficiency of 95% for each vessel (60.5395(d)(1)), and under 60.5400 referencing NSPS VVa at 60.482-10a(c).
Evaluate Energy, Environment, Indirect economic	N/A is BACT	N/A is BACT
Economic analysis	N/A is BACT	N/A is BACT
BACT Selection	**Yes**	**Yes**

a. Pipeline quality natural gas is defined as gas having sulfur content of 5 gr/100 scf or less.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 22. Flares: Natural Gas Pilot plus SSM: NOx, CO, VOC, PM-10, PM-2.5, and GHG BACT (Units FL1, FL2, and FL3)

	Pipeline Quality Natural Gas[a]	Good Combustion, Operating, and Maintenance Practices (for all criteria pollutants)	Good Flare Design (for all criteria pollutants)	Carbon Capture and Sequestration (CCS)	Flare Gas Recovery System
Identified Air Pollution Control Technologies	**Applicant:** Use of low sulfur, natural gas as fuel results in low SO2, PM, PM-10, PM-2.5, and GHG emissions. **AQB:** It is not clear how combusting natural gas reduces GHG emissions.	**Applicant:** Good combustion and operating practices are a potential control option for improving the combustion efficiency of the flares. Good combustion practices include proper operation and design, maintenance, and tune-up of the flares at least annually per the manufacturer's specifications.	**Applicant:** Good flare design can be employed to destroy large fractions of the flare gas. Good flare design includes pilot flame monitoring, flow measurement, and monitoring/control of waste gas heating value.	**Applicant:** CCS was also briefly discussed. With no ability to collect exhaust gas from a flare other than using an enclosure, post combustion capture is not an available control option. Pre-combustion capture has not been demonstrated for removal of CO2 from intermittent process gas streams routed to a flare. Flaring will be limited to emergency situations and during planned SSM of limited duration and vent rates resulting in a very intermittent CO2 stream; thus, CCS is not considered a technically feasible option. Therefore, it was eliminated from consideration. **AQB:** Agrees.	**Applicant:** Installing a flare gas recovery system to recover flare gas to the fuel gas system is considered a feasible control technology for industrial process flares. Flaring at the facility will be limited to emergency situations and during planned SSM events of limited duration and vent rates. Due to infrequent maintenance of compressor blowdown activities and the amount of gas sent to the flare, it is technically infeasible to re-route the flare gas to a process fuel system and hence, the gas will be combusted by the flare for control. Therefore, the amount of flare gas produced by this project will not sustain a flare gas recovery system. For this project, flare gas recovery is infeasible. **AQB:** Agrees.
Feasibility Evaluations	**Applicant:** Included in RBLC. **AQB:** The use of low sulfur natural gas as the pilot gas and assist gas (if used) is feasible and will reduce emissions of SO2, PM, PM10, and PM2.5.	**Applicant:** Included in RBLC. **AQB:** Sufficient oxygen and proper mixing are required for complete combustion and to minimize smoking[d]. Steam and air must also be controlled to not be excessive, as this leads to flame quenching[c] .The permittee will also meet 40 CFR 60.11 and 60.18 to demonstrate compliance with this BACT, which regulate the exit velocity for the gas stream. Additional information on feasible good combustion/operating practices (gas flow rate turndown, assist ratios, etc) is described in the TCEQ 2010 Flare Study Final Report[e]	**Applicant:** Included in RBLC. **AQB:** Destruction efficiencies of 98% or greater can be achieved with heat contents >300 BTU/scf (assisted) or >200 BTU/scf (non-assisted)[c]. Steam, air, or pressure assisted flares have more stable flames. Knock-out drums are needed if there are liquids in the vent stream gas to prevent smoking.[d]	See comments above	See comments above
Technically feasible?	**Yes**	**Yes**	**Yes**	**No**	**No**
Other	**Applicant:** The control of CH4 in the process gas (e.g., compressor blowdowns, other SSM) by the flare results in the creation of additional CO2 emissions via the combustion reaction mechanism. However, given the relative GWPs[b] of CO2 and CH4 and the destruction of VOCs, it is appropriate to apply combustion controls to CH4 emissions even though it will form additional CO2 emissions. **AQB:** Agrees with this assessment.	The flares will meet the minimum requirements set out in 40 CFR §60.18 which will provide a destruction efficiency of 98% for VOCs, CH4, and H2S. The applicant has provided SSM emission figures for flares FL1 and FL2 which will become BACT (pph for criteria pollutants and tpy for CO2e). Only pilot and purge emission limits are permitted for FL3. No routine or predictable emissions from startup, shutdown, or maintenance of the facility are permitted. FL3 (the Lusk flare) is used only in the event of a complete facility-wide shutdown caused by an emergency.	N/A is BACT	N/A not technically feasible	N/A not technically feasible

Table 22, cont.

Pipeline Quality Natural Gas[a]	Good Combustion, Operating, and Maintenance Practices (for all criteria pollutants)	Good Flare Design (for all criteria pollutants)	Carbon Capture and Sequestration (CCS)	Flare Gas Recovery System	Pipeline Quality Natural Gas[a]
Evaluate Energy, Environment, Indirect economic	N/A is BACT	N/A is BACT	N/A is BACT	N/A not technically feasible	N/A not technically feasible
Economic analysis	N/A is BACT	N/A is BACT	N/A is BACT	N/A not technically feasible	N/A not technically feasible
BACT Selection	**Yes**	**Yes**	**Yes**	**No**	**No**

a. Pipeline quality natural gas is defined as gas having sulfur content of 5 gr/100 scf or less.

b. GWPs = global warming potentials. CO2 is the base with a factor of 1, while CH4 has a factor of 25 (meaning for each ton of CH4 emitted, multiply by 25).

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

c. US EPA August 2012 Enforcement Alert EPA 325-F-012-002

d. US EPA, Air Pollution Control Technology Fact Sheet for flares EPA-452/F-03-019

e. Texas Commission on Environmental Quality, August 2011. "TCEQ 2010 Flare Study Final Report" PGA No. 582-8-862-45-FY09-04, Tracking No. 2008-81

Table 23. Fugitives: VOC and GHG BACT (Unit FUG)

	Control Technologies →→→				
	Implementation of LDAR[a]	**Installation of Leakless Equipment**	**Alternative Monitoring Program - Remote Sensors / Infrared Technologies**	**Audio/Visual/Olfactory (AVO) Monitoring Program[a]**	**Use High Quality Components and Materials of Construction Compatible with Process**
Identified Air Pollution Control Technologies	**Applicant:** The LDAR program has traditionally been developed for the control of VOC emissions. BACT determinations related to control of VOC emissions rely on technical feasibility, economic reasonableness, reduction of potential environmental impacts, and regulatory requirements for these instrumented programs.	**Applicant:** Leakless technology valves are available and currently in use, primarily where highly toxic or otherwise hazardous materials are used.	**Applicant:** Alternate monitoring programs such as remote sensing technologies have been proven effective in leak detection and repair. The use of sensitive infrared camera technology has become widely accepted as a cost effective means for identifying leaks of hydrocarbons.	**Applicant:** Leaking fugitive components can be identified through audio, visual, or olfactory (AVO) methods. Detection can be direct viewing of leaking gases, or a secondary indicator such as condensation around a leaking source.	**Applicant:** The use of high quality equipment that is designed for the specific service in which it is employed results in effective control of fugitive emissions. Valves with lower runout on the valve stem, and the valve stem polished to a smoother surface are examples.
Feasibility Evaluations	**Applicant:** Technically feasible. Included in RBLC for the control of VOC emissions from fugitive VOC emissions.	**Applicant:** Technically Infeasible. Not universally adopted. Not implemented for VOC compounds.	**Applicant:** Technically feasible.	**Applicant:** Technically feasible for the identification of larger leaks. AVO programs are common and in place in industry.	**Applicant:** Technically feasible.
Technically feasible?	**Yes**	**No**	**Yes, but LDAR is more effective**	**Yes**	**Yes**
Other	**Applicant:** LDAR and Adhere to 40 CFR 60 Subpart OOOO Equipment Leak Requirements. **AQB: BACT:** As proposed by DCP, the facility shall conduct quarterly (or more frequently) instrumented monitoring at a leak detection level of 500 ppmv (2000 ppmv for pumps and compressors) according to the requirements of NSPS OOOO (e.g., monthly inspections) and implement a maintenance program. Monitoring shall be for VOC and CH4.		**Applicant:** Choosing a higher ranked control technology, therefore no further evaluation required. **AQB:** An LDAR program per recently promulgated NSPS OOOO will be implemented (see first column).	**Applicant:** Choosing a higher ranked control technology, therefore no further evaluation required. **AQB:** An LDAR program per recently promulgated NSPS OOOO will be implemented (see first column).	**Applicant:** Choosing a higher ranked control technology, therefore no further evaluation required. **AQB:** An LDAR program per recently promulgated NSPS OOOO will be implemented (see first column).
Evaluate Energy, Environment, Indirect economic	**Applicant:** Monitoring direct emissions of CO2 is not feasible with the normally used instrumentation for fugitive emissions monitoring. However, instrumented monitoring is technically feasible for components in CH4 service.	**Applicant:** Some leakless technologies, such as bellows valves, if they fail, cannot be repaired without a unit shutdown which often generates additional emissions.	**Applicant:** No adverse energy, environmental, or economic impacts. Effectiveness is likely comparable to EPA Method 21 when cost is included in the consideration.	N/A using LDAR	N/A using LDAR
Economic analysis	N/A is BACT	**Applicant:** These technologies are generally considered cost prohibitive except for specialized service.	**Applicant:** The use of sensitive infrared camera technology has become widely accepted as a cost effective means for identifying leaks of hydrocarbons.	N/A using LDAR	N/A using LDAR
BACT Selection	**Yes**	**No**	**No**	**No**	**No**

a. EPA document "Leak Detection and Repair - A Best Practices Guide" (http://www.epa.gov/Compliance/resources/publications/assistance/ldarguide.pdf)

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 24. Haul Road: PM-10/PM-2.5 BACT (Unit HAUL)

	Control Technologies →→→ **Paving**	**Speed Reduction**
Identified Air Pollution Control Technologies	**Applicant:** A durable surface material like asphalt or concrete is laid out on the road, to sustain vehicular traffic.	**Applicant:** A limit on the speed of the vehicular traffic is imposed, which prevents disturbance of particulate matter from the surface of the road.
Feasibility Evaluations	**Applicant:** Included in RBLC.	**Applicant:** Included in RBLC. Include speed bumps at regular intervals. **AQB:** The estimated total length of the road is approximately 530 ft. Speed humps not required to meet emissions calculations, see "other" below
Technically feasible?	**Yes**	**Yes**
Other		Original application included a speed limit of 25 mph and speed humps since the road was not going to be paved. Since it is now paved, a speed limit and speed humps are no longer needed as the speed does not affect emission rates from the paved road. AQB reviewed the calculations for paved haul roads in AP-42 section 13.2.1 and found that the emission factors for paved roads are considered appropriate for vehicles traveling 1-55 mph, therefore the speed humps are not necessary to control speed on the paved road.
Evaluate Energy, Environment, Indirect economic	N/A is BACT	N/A, not required to meet BACT for emissions
Economic analysis	N/A is BACT	N/A, not required to meet BACT for emissions
BACT Selection	**Yes**	**No**

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 25. Diesel Emergency Engine: NOx BACT (Unit GEN-1)

	Control Technologies →→→				
	Selective Catalytic Reduction (SCR)[a]	**Non-Selective Catalytic Reduction (NSCR)**	**Turbocharged & Charge Air Cooled**	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Nitrogen-based reagent (e.g., NH3, urea) is injected into exhaust stream downstream of combustion unit. The reagent reacts selectively with NOx to produce N2 and water in a reactor vessel containing a metallic or ceramic catalyst. Temps 480 - 800 °F (variations ± 200 °F); inlet NOx concentration as low as 20 ppm (efficiency improves with increased concentration up to 150 ppm). Unreacted reagent may form ammonium sulfates which may plug or corrode downstream equipment. Particulate-laden streams may blind the catalyst and may necessitate the application of a sootblower.	**Applicant:** This technique uses residual hydrocarbons and CO in rich-burn engine exhaust as a reducing agent for NOx. In an NSCR, hydrocarbons and CO are oxidized by O2 and NOx. The excess hydrocarbons, CO, and NOx pass over a catalyst (usually a noble metal such as platinum, rhodium, or palladium) that oxidizes the excess hydrocarbons and CO to H2O and CO2, while reducing NOx to N2[b].	**AQB**: Turbocharged engines with charge air coolers. The air coolers are heat exchangers located between the turbo charger and the engine air inlet manifold. These are used in stressful engine environments such as those with turbochargers. The density of the air increases increasing combustion efficiency and reducing emissions. Turbocharges also increase combustion efficiency and engine temperature, which can result in an increase in NOx emissions. However, the coolers also act to lower NOx emission rates by reducing the combustion temperature. Since the turbocharger increases temperature it would decrease emissions of particulate matter through more complete combustion. However, we were not able to determine if the air coolers reduce the temperature enough to counteract any benefit from the turbochargers.	**Applicant:** This unit falls under NSPS Subpart IIII Table 1 (Emission Standards), fuel requirements, monitoring and compliance and reporting requirements. In addition, this unit needs to meet 40 CFR Part 89 non-road compression-ignition engine emission standards. A**QB:** This unit is regulated under NSPS 40 CFR 60 Subpart IIII if the model year is after 2007. If the engine is model year 2011 or later, 60.4201 requires the manufacturer of this unit to certify that it meets 40 CFR 1039 or 40 CFR 89 non-road compression-ignition engine emission standards. Part 89 standards differ based on the model year of the engine. **Date of manufacture in application is "TBD"**.	**Applicant:** NOx emissions are caused by oxidation of N2 in the combustion air during fuel combustion. This occurs due to high combustion temperatures and insufficiently mixed air and fuel in the cylinder where pockets of excess oxygen occur. These effects can be minimized through air-to-fuel ratio control, ignition timing reduction, and fuel quality analysis and fuel handling. This practice includes the use of Ultra Low Sulfur Diesel. **AQB:** This approach implements the guidelines published by USEPA. Application section 12 (BACT) table 4-4 details elements of GCP, including tune-up and maintenance of equipment at least annually.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of NOx emissions from small diesel fuel stationary internal combustion engines. Technically infeasible for small diesel fuel engines which typically operate as backup power generator units. These units only operate during power failure outages for very few hours per year. **AQB:** The catalyst must reach a certain temperature before the SCR controls NOx emissions. The ammonia and treated gas velocity must also be uniform to effectively control NOx. Finally, ammonia slip increases when temperatures in the gas stream are too low. Since standby emergency generators are used intermittently and make for short periods of time, an SCR would not effectively control NOx emissions. It is technically infeasible.	**Applicant:** Not included in RBLC for the control of NOx emissions from small diesel gas-fired lean-burn stationary internal combustion engines. Lean-burn engine cannot be retrofitted with NSCR due to reduced exhaust temperatures. NSCR is limited to engines with normal exhaust oxygen levels of 4% or less including 4SRB naturally aspirated and 4SRB turbocharged. Technically infeasible. **AQB:** The AQB agrees that this control method is technically infeasible.	**AQB:** Is technically feasible. Turbocharger with Charge Air Cooled system is the emissions control listed on the manufacturer's specifications.	**Applicant:** Included in RBLC for the control of NOx emissions from small diesel engines. **AQB:** This control method is technically feasible.	**Applicant:** Included in RBLC for the control of NOx emissions from small diesel engines. **AQB:** GCP is technically feasible for all sources of combustion emissions.
Technically Feasible?	**No**	**No**	**Yes**	**Yes**	**Yes**
AQB review of RBLC for numerical limits	None for this source type and control.	None for this source type and control.		Range of NOx emission limits in RBLC is 3.0 to 5.6 g/hp-hr for 3 entries in application. AQB found an additional 3 entries with 2.98, 3.88 and 4.8 g/hp-hr limits.	Same as that for NSPS IIII & Tier 3.

Table 25, cont.

	Control Technologies →→→				
	Selective Catalytic Reduction (SCR)[a]	**Non-Selective Catalytic Reduction (NSCR)**	**Turbocharged & Charge Air Cooled**	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Good Combustion Practices (GCP)**
Evaluate Energy, Environment, Indirect economic	**AQB:** SCR requires ammonia. Transporting, storing, and using ammonia comes with its own environmental risks from spills or releases to the atmosphere. It is an AQB Toxic Air Pollutant. Ammonia slip also contributes to the formation of secondary PM2.5. Therefore SCRs are more appropriate for larger sources of combustion air emissions that operate on a more continuous basis.	**AQB:** N/A, not technically feasible. NSCRs are more appropriate for larger sources of combustion air emissions that operate on a more continuous basis.		N/A is BACT	N/A is BACT
Economic analysis	N/A, not technically feasible	N/A not technically feasible		N/A is BACT	N/A is BACT
BACT Selection	N/A, not technically feasible	N/A, not technically feasible	**AQB: Yes.** The permit will require that the engine include the stated manufacturer controls.	**Yes.** BACT Floor: NSPS IIII provides a NOx limit of 6.9 g/hp-hr per Table 1 for pre-2007. Part 89 provide a limit of 4.7 g/kw-hr (=3.5 g/hp-hr) for model year 2014 or newer. **BACT Limit of 3.3 g/bhp-hr** based on RBLC (similar to RBLCID # MI-0412, NV-0047, and CA-1212) which was also proposed in the application and used to calculate mass emission rates used in modeling.	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Selective Catalytic Reduction (SCR))," EPA-452/F-03-032.
b. U.S. EPA, AP-42, Section 3.2 "Natural Gas-Fired Reciprocating Engines"

c. Texas Commission on Environmental Quality (TCEQ) Combustion Sources: Current best available control technology (BACT) guidelines. 2010. http://www.tceq.texas.gov/permitting/air/nav/air_bact_combustsources.html

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 26. Diesel Emergency Engine: CO BACT (Unit GEN-1)

	Control Technologies →→→				
	Regenerative Thermal Oxidizer	**Recuperative Thermal Oxidizer**	**Catalytic Oxidation[d]**	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Oxidizes combustible materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. At temps of 1,400 - 1,500 °F[b] ; inlet flow rate 5,000 - 500,000 scfm[b] ; inlet CO concentration as low as 100 ppmv or less[b]	**Applicant:** Oxidizes combust materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. At temps of 1,100 - 1,200 °F[c] ; inlet flow rate 500 - 50,000 scfm[c] ; inlet CO concentration as low as 100 ppmv or less[b]. **AQB:** The citation for CO at 100 ppmv is for regenerative TO. The correct cite for recuperative TO is 1500-3000 ppmv[c].	**Applicant:** Similar to thermal incineration; waste stream is heated and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. At temps of 600 - 800 °F (not to exceed 1,250 °F). Inlet flow rate 700 - 50,000 scfm. Inlet CO concentration as low as 1 ppmv.	**Applicant:** This unit falls under NSPS Subpart IIII Table 1 (Emission Standards), fuel requirements, monitoring and compliance and reporting requirements. In addition, this unit needs to meet 40 CFR Part 89 non-road compression-ignition engine emission standards. **AQB:** This unit is regulated under NSPS 40 CFR 60 Subpart IIII if the model year is after 2007. If the engine is model year 2011 or later, 60.4201 requires the manufacturer of this unit to certify that it meets 40 CFR 1039 or 40 CFR 89 non-road compression-ignition engine emission standards. Part 89 standards differ based on the model year of the engine.	**Applicant:** Operate and maintain the equipment in accordance with good pollution control practices and with good combustion practices. **AQB:** This approach implements the guidelines published by USEPA. Application section 12 (BACT) table 4-4 details elements of GCP, including tune-up and maintenance of equipment at least annually.
Feasibility Evaluations	**Applicant:** ~~Not included in RBLC for the control of CO emissions from large natural gas-fired lean-burn stationary internal combustion engines.~~ Technically infeasible The installation of this control technology in such a small diesel engine used as a backup generator is impractical. **AQB: T**hese are used for process gas streams requiring ventilation such as paint booths, printing and paper mills with high waste stream flowrates. CO emissions from a small diesel engine that is run only periodically would not be completely combusted as this technology requires high temperatures and residence times.	**Applicant:** Technically infeasible. For small diesel fuel engines which typically operate as backup power generator units. These unis only operate during power failure outages for very few hours per year. **AQB:** Although the exhaust air is pre-heated before entering the auxiliary burner, the exhaust must be held at a certain temperature for a sufficient length of time for complete combustion of CO to CO2. Therefore, an RTO does not effectively control CO emissions from standby emergency generators that are infrequently run and often for short periods of time. It is technically infeasible.	**Applicant:** Not included in RBLC for the control of CO emissions from small diesel fuel internal combustion engines. The installation of this control technology in such a small diesel engine used as a backup generator is impractical. **AQB:** The catalyst must reach and maintain a certain temperature for complete combustion of CO emissions. Therefore, an oxidation catalyst does not effectively control CO emissions from standby emergency generators that are typically used for short durations. It is technically infeasible.	**AQB:** NSPS IIII and Tier 3 are already required for these type engines and is the BACT floor. Therefore, it must be technically feasible to meet these requirements.	**Applicant:** Included in RBLC for the control of CO emissions from internal combustion engines. **AQB:** Good combustion practices is technically feasible for all combustion sources of air emissions.
Technically feasible?	**No**	**No**	**No**		**Yes**
AQB review of RBLC for numerical limits and other applicant notes	**Applicant:** Not included in RBLC for control of CO emissions from small diesel fuel internal combustion engines. **AQB:** N/A. A regenerative Thermal Oxidizer is not technical feasible.	**Applicant:** Applicant: Not technically feasible. The installation of this control technology in such a small diesel engine used as a backup generator is impractical. **AQB:** N/A. RTO is not technically feasible for diesel engines that are run for short periods of time.	**AQB:** N/A. An oxidation catalyst is not technically feasible for diesel engines that are run for short periods of time.	CO emissions in RBLC from applicant are 3.7 g/hp-hr from 3 entries. AQB found CO of 2.6 for 2 more entries, and one entry with 0.5 (this CO level was associated with a higher NOx level than selected for BACT)	The proposed GCP in Table 4-4 matches the EPA document originally cited by DCP (no longer available on EPA website). The permit will require a condition that will implement GCP.

Table 26, cont.

	Control Technologies →→→				
	Regenerative Thermal Oxidizer	**Recuperative Thermal Oxidizer**	**Catalytic Oxidation[d]**	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Good Combustion Practices (GCP)**
Evaluate Energy, Environment, Indirect economic	N/A, not technically feasible	**AQB:** The cost and maintenance of an RTO would be more appropriate for larger sources of emissions that run on a more continuous basis.	**AQB:** N/A, not technically feasible. Also, the cost and maintenance of a catalytic oxidizer would be more appropriate for larger sources of emissions that run on a more continuous basis.	N/A, is BACT	N/A, is BACT
Economic analysis	N/A, not technically feasible	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
BACT Selection	**No**	**No**	**No**	**Yes.** BACT Floor: NSPS IIII does not provide a CO limit per Table 1 for pre-2007. Part 89 provide a limit of 5.0 g/kw-hr (= 3.7 g/hp-hr) for model year 2014 or newer. **BACT Limit of 3.7 g/bhp-hr** based on Parts 1039/89, the application proposal and emissions calculations. Note: because a unit is not yet selected, the applicant is responsible for making sure the selected model year meets the applicable BACT. The AQB is not choosing the lower 2.6 g/bhp limit from the RBLC website since this would require periodic emissions testing of these units to verify emission rates. This would require running the engine for the purpose of stack tests and result in more emissions to the atmosphere.	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Regenerative Incinerator)," EPA-452/F-03-021.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Recuperative Incinerator)," EPA-452/F-03-020.

d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 27. Diesel Emergency Engine: VOC BACT (Unit GEN-1)

	Control Technologies →→→				
	Regenerative Thermal Oxidizer	**Recuperative Thermal Oxidizer**	**Catalytic Oxidation**[d]	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Oxidizes combustible materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. At temps of 1,400 - 1,500 °F[b] ; inlet flow rate 5,000 - 500,000 scfm[b] ; inlet VOC concentration as low as 100 ppmv or less[b.]	**Applicant:** Oxidizes combustible materials by raising the temperature of the material above auto-ignition point in presence of O2 and maintaining the high temp for sufficient time to complete combustion[a]. At temps of 1,100 - 1,200 °F[c] ; inlet flow rate 500 - 50,000 scfm[c] ; inlet CO concentration as low as 100 ppmv or less[b.]. **AQB:** The citation for CO at 100 ppmv is for regenerative TO. The correct cite for recuperative CO is 1500-3000 ppmv[c].	**Applicant:** Similar to thermal incineration; waste stream is heated and then passes through a catalyst bed that increases the oxidation rate more quickly and at lower temperatures. At temps of 600 - 800 °F (not to exceed 1,250 °F). Inlet flow rate 700 - 50,000 scfm. Inlet VOC concentration as low as 1 ppmv.	**Applicant:** This unit falls under NSPS Subpart IIII Table 1 (Emission Standards), fuel requirements, monitoring and compliance and reporting requirements. In addition, this unit needs to meet 40 CFR Part 89 non-road compression-ignition engine emission standards. **AQB:** This unit is regulated under NSPS 40 CFR 60 Subpart IIII if the model year is after 2007. If the engine is model year 2011 or later, 60.4201 requires the manufacturer of this unit to certify that it meets 40 CFR 1039 or 40 CFR 89 non-road compression-ignition engine emission standards. Part 89 standards differ based on the model year of the engine. **Date of manufacture in application is "TBD"**.	**Applicant:** Operate and maintain the equipment in accordance with good pollution control practices and with good combustion practices. **AQB:** This approach implements the guidelines published by USEPA. Application section 12 (BACT) table 4-4 details elements of GCP, including tune-up and maintenance of equipment at least annually. The permit will include a condition to implement GCP.
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of VOC emissions from large natural gas-fired lean-burn stationary internal combustion engines. **AQB:** See feasibility analysis for CO.	**Applicant:** Not included in RBLC for the control of VOC emissions from large natural gas-fired lean-burn stationary internal combustion engines. Not technically feasible. **AQB:** See feasibility analysis for CO.	**Applicant:** Not included in RBLC for the control of VOC emissions from small diesel fuel internal combustion engines. The installation of this control technology in such a small diesel engine used as a backup generator is impractical. **AQB:** See feasibility analysis for C**O.**	**AQB:** NSPS IIII and Tier 3 are already required for these type engines and is the BACT floor. Therefore, it must be technically feasible to meet these requirements.	**Applicant:** Included in RBLC for the control of VOC emissions from internal combustion engines. **AQB:** Good combustion practices is technically feasible for all combustion sources of air emissions.
Technically feasible?	**No**	**No**	**No**		**Yes**
AQB review of RBLC for numerical limits and other applicant notes	**Applicant:** Technically infeasible. **AQB:** N/A. See notes reading regenerative thermal oxidizers for CO emissions.	**Applicant:** Not Technically infeasible. **AQB:** N/A. See notes regarding recuperative thermal oxidizers for CO emissions.	**AQB:** N/A. See notes regarding oxidation catalysts for CO.	NSPS IIII limit applies, which references emission limit in 40 CFR Part 89, which has a combined NOx+NMHC limit of 4.7 g/kW-hr. Using the California Air Resources Board assumed breakdown of 95% NOx, 5% VOC BACT is **0.18g/bhp-hr**	A search of EPA websites/documents did not produce additional guidance on specific recommendations for good combustion practices. The proposed GCP in Table 4-4 matches the EPA document originally cited by DCP (no longer available on EPA website)
Evaluate Energy, Environment, Indirect economic	**AQB:** N/A, not technically feasible. See analysis for CO.	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
Economic analysis	N/A, not technically feasible	N/A, not technically feasible	N/A, not technically feasible	N/A, is BACT	N/A, is BACT
BACT Selection	**No**	**No**	**No**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Thermal Incinerator)," EPA-452/F-03-022.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Regenerative Incinerator)," EPA-452/F-03-021.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Recuperative Incinerator)," EPA-452/F-03-020.

d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Catalytic Incinerator)," EPA-452/F-03-018.
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 28. Diesel Emergency Engine: PM BACT (Unit GEN-1)

	Control Technologies →→→							
	Baghouse / Fabric Filter[a]	**Electrostatic Precipitator (ESP)**[b,c,d]	**Cyclone**[e]	**Diesel Particulate Filters (not addressed in applicant's proposed BACT)**[f, g]	**Turbocharged & Charge Air Cooled**	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Ultra Low Sulfur Diesel Fuel**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** Process exhaust gas passes through a tightly woven or felted fabric arranged in sheets, cartridges, or bags that collect PM via sieving and other mechanisms. The dust cake that accumulates on the filters increases collection efficiency. Various cleaning techniques include pulse-jet, reverse-air, and shaker technologies. Up to 500 °F (Typical); inlet flows 100 - 100,000 scfm (Standard), 100,000 - 1,000,000 scfm (Custom); inlet PM concentration 0.5 - 10 gr/dscf (Typical), 0.05 - 100 gr/dscf (Achievable)	**Applicant:** Electrodes stimulate the waste gas and induce an electrical charge in the entrained particles. The resulting electrical field forces charged particles to collector walls from which the material may be mechanically dislodged and collected in dry systems or washed with water deluge in wet systems. Up to 1,300 °F (dry), Lower than 170 - 190 °F (wet); inlet flow 1,000 - 100,000 scfm (Wire-Pipe), 100,000 - 1,000,000 scfm (Wire-Plate); inlet PM concentration 0.5 - 5 gr/dscf (Wire-Pipe), 1 - 50 gr/dscf (Wire-Plate)	**Applicant:** Centrifugal forces drive particles in the gas stream toward the cyclone walls as the waste gas flows through the conical unit. The captured particles are collected in a material hopper below the unit. Up to 1,000 °F; inlet flow 1.1 - 63,500 scfm (single) up to 106,000 scfm (in parallel); inlet PM concentration 0.44 - 7,000 gr/dscf	**AQB**: Diesel particulate filters (DPFs) are used to reduce particulate emissions from diesel equipment and engines. If engineered correctly for the application and if exhaust PM load is sufficient, DPFs can reduce pm by 85 to 90+%. After trapped on a catalyst it is combusted to ash during filter regeneration. Exhaust temps must be increased to regenerate the filters. This is done passively (exhaust temp already high enough), active requires other sources of fuel or heat to raise the temperature. The filter must also be periodically cleaned or replaced. DPFs have been used on nonroad engines since the 1980s. There are also flow-through filters but these are still a somewhat new technology and reduce PM by only 30-70%.	**AQB**: Turbocharged engines with charge air coolers. The air coolers are heat exchangers located between the turbo charger and the engine air inlet manifold. These are used in stressful engine environments such as those with turbochargers. The density of the air increases increasing combustion efficiency and reducing emissions. Turbocharges also increase combustion efficiency and engine temperature, which can result in an increase in NOx emissions. However, the coolers also act to lower NOx emission rates by reducing the combustion temperature. Since the turbocharger increases temperature it would decrease emissions of particulate matter through more complete combustion. However, we were not able to determine if the air coolers reduce the temperature enough to counteract any benefit from the turbochargers.	This unit falls under NSPS Subpart IIII Table 1 (Emission Standards), fuel requirements, monitoring and compliance and reporting requirements. In addition, this unit needs to meet 40 CFR Part 89 Non-road compression ignition engine emission standards.	**Applicant:** Diesel fuel containing 15 part per million (ppm) of Sulfur.	**Applicant:** Operate and maintain the equipment in accordance with good air pollution control practices and with good combustion practices. **AQB:** Particulate matter is created during the incomplete combustion of diesel fuel. The more complete the combustion the lower the PM but the higher the NOx. For emergency generators, PM would be of greater concern than NOx as PM is considered a potential carcinogenic substance. The permit will include a condition to implement GCP.

Table 28, cont.

	Control Technologies →→→							
	Baghouse / Fabric Filter[a]	**Electrostatic Precipitator (ESP)**[b,c,d]	**Cyclone**[e]	**Diesel Particulate Filters (not addressed in applicant's proposed BACT)**[f, g]	**Turbocharged & Charge Air Cooled**	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Ultra Low Sulfur Diesel Fuel**	**Good Combustion Practices (GCP)**
Feasibility Evaluations	**Applicant:** Not included in RBLC for the control of PM emissions for small diesel fuel stationary internal combustion engines. **AQB:** Not appropriate for this emission source. The AQB could find no information where fabric filters (or scrubbers) have ever been used to control PM emissions from small or large CI stationary engines. **See analysis of diesel particulate filters.** Also, the exhaust temp of the diesel engine is 391-401 deg F. According to EPA baghouses typically handle temps as high as 550 deg F unless spray coolers or dilution air can be used to lower temps. It's also not clear if a fabric filter would be effective on ultrafine particulates.	**Applicant:** Not included in RBLC for the control of PM emissions for small diesel fuel stationary internal combustion engines. **AQB:** Not appropriate for this emission source. The AQB could find no examples where ESPs are used on small or large CI engines. See analysis of diesel particulate filter. ESPs won't work if exhaust velocity is distribution is not uniform, big changes in exhaust temperatures. Also, ESPs require energy input that would result in additional air emissions. Not technical feasible.	**Applicant:** Not included in RBLC for the control of PM emissions for small diesel fuel stationary internal combustion engines. **AQB:** Ultrafine particulates (less than 0.1 microns) make up 80 to 95% of diesel soot. Cyclones are used for larger particulates and are not effective on this small of PM. Therefore, cyclones are not technically feasible.	**AQB:** We were not able to verify if PM exhaust out emissions ranging from 0.31 to 0.05 gr/hp-hr would be high enough for a DPF to effectively reduce PM emissions. All information regarding DPFs applies to retrofitting engines that do not currently meet the Tier 3 standards and appear to apply to older, higher emitting engines. Therefore, we must conclude that this control is not technically feasible for engines with already low emission rates of all pollutants that are run intermittently, for sometimes short periods of time. If the unit was run on a continuous basis, it may more effectively reduce emissions, but more information is needed. The flow-through filters are not a proven technology and only reduce pm by 30 to 70%.	**AQB:** Is technically feasible. Turbocharger with Charge Air Cooled system is the emissions control listed on the manufacturer's specifications.	**AQB:** NSPS IIII and Tier 3 are already required for these type engines and is the BACT floor. Therefore, it must be technically feasible to meet these requirements.	**Applicant**: Included in the RBLC for the control of SOx emissions from small diesel fuel combustion engines. **AQB:** Not sure if this is a typographical error since this is the BACT for PM not SO2. However, combustion of sulfur converts to SO2 which can convert to secondary PM2.5. Therefore, a lower sulfur content would reduce PM emissions. The manufacturer's emissions specifications also require a maximum fuel sulfur content of 500 ppm (0.05% by weight). Therefore, ULSD is required in order to meet manufacturer's operating requirements.	**Applicant**: Included in the RBLC for the control of PM emissions from small diesel fuel combustion engines. **AQB:** Good combustion practices is technically feasible for all combustion sources of air emissions.
Technically feasible?	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**

Other	No	**Applicant:** Dry ESP efficiency varies significantly with dust resistivity. Air leakage and acid condensation may cause corrosion.	**Applicant:** Cyclones exhibit lower efficiencies when collecting smaller particles. High-efficiency units may require substantial pressure drop.		**AQB:** The permit will require that the engine include the stated manufacturer controls.		**Applicant**: Proposed BACT is 0.02 **g/bhp-hr** by implementing EPA Tier III non-road regulatory emission requirements, using ultra low sulfur diesel fuel and good combustion practices. **AQB**: The proposed limit is actually the EPA Tier 4 regulatory limit, which should apply to non-emergency engines for years 2013 and newer. The Tier 3 value of 0.3 g/hp-hr is selected as BACT	**AQB:** This approach goes in tandem with pipeline quality natural gas.

Table 28, cont.

	Control Technologies →→→							Control Technologies →→→
	Baghouse / Fabric Filter[a]	**Electrostatic Precipitator (ESP)**[b,c,d]	**Cyclone**[e]	**Diesel Particulate Filters (not addressed in applicant's proposed BACT)**[f, g]	**Turbocharged & Charge Air Cooled**	**NSPS Subpart IIII and EPA Tier 3 Regulatory Emissions**	**Ultra Low Sulfur Diesel Fuel**	**Baghouse / Fabric Filter**[a]
Evaluate Energy, Environment, Indirect economic		**AQB:** Using an ESP requires additional energy which would increase the overall air emission rates from the facility.	N/A, not technically feasible	**AQB:** An active DPF regeneration system would add additional air emissions to an emission source with already very low emission rates.		N/A, is BACT	N/A, is BACT	N/A, is BACT
Economic analysis	**Applicant:** None provided. **AQB:** EPA has performed cost analyses procedures[a].	N/A, not technically feasible	N/A, not technically feasible			N/A, is BACT	N/A, is BACT	N/A, is BACT
BACT Selection	**No**	**No**	**No**	**No**		**Yes**	**Yes**	**Yes**

a. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Fabric Filter - Pulse-Jet Cleaned Type)," EPA-452/F-03-025.

b. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Dry Electrostatic Precipitator (ESP) - Wire-Pipe Type)," EPA-452/F-03-027.

c. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Dry Electrostatic Precipitator (ESP) - Wire-Plate Type)," EPA-452/F-03-028.

d. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Wet Electrostatic Precipitator(ESP) - Wire-Pipe Type)," EPA-452/F-03-029.

e. U.S. EPA, Office of Air Quality Planning and Standards, "Air Pollution Control Technology Fact Sheet (Cyclone)," EPA-452/F-03-005.

f. USEPA Technical Bulletin Diesel Particulate Filter General Information. National Clean Diesel Campaighn. EPA-420-F-10-029, May 2010.

g. MECA Clean Air Facts. Emission Controls for Diesel Engines. Downloaded 9-7-2015.

h. Friterm Charge Air Coolers. 5-26-2005, Rev 0.0 Downloaded 9-7-15 http://www.friterm.com/getattachment/f46bff1e-967c-4c9e-b89c-cfe6e4112375/387.aspx

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 29. Diesel Emergency Engine: SO_2 BACT (Unit GEN-1)

	Control Technologies →→→
	Ultra Low Sulfur Diesel Fuel
Identified Air Pollution Control Technologies	**Applicant:** Diesel fuel containing 15 part per million (ppm) of Sulfur.
Feasibility Evaluations	**Applicant**: Included in the RBLC for the control of SOx emissions from small diesel fuel combustion engines. **AQB:** 15 ppm of sulfur per gallon is required by NSPS IIII and is the BACT floor. There is no diesel fuel available with a lower sulfur content, therefore this is also BACT.
Technically feasible?	**Yes**
Other	**AQB:** SO2 BACT Limit is 15 ppmv of sulfur per gallon of diesel fuel which is the current US standard for ultra low sulfur diesel fuel (ULSD)
Evaluate Energy, Environment, Indirect economic	N/A is BACT
Economic analysis	N/A is BACT
BACT Selection	**Yes**

a. U.S. EPA., AP-42, Section 3.3, "Stationary Internal Combustion Sources"

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 30. Diesel Emergency Engine: GHG BACT (Unit GEN-1)

	Control Technologies →→→		
	Carbon Capture and Sequestration (CCS)	**Air/Fuel Ratio Controllers**	**Good Combustion Practices (GCP)**
Identified Air Pollution Control Technologies	**Applicant:** For the engines, CCS would involve post combustion capture of the CO_2 from the engines and sequestration of the CO_2 in some fashion. **AQB:** CCS may be defined variously, through several steps, but first involves the capture of CO_2 (that would otherwise be released to the atmosphere), transport (short or longer distance), then sequestration or storage in some location or form where it is prevented from entering the atmosphere. Sequestration could take various forms such as use of CO_2 in other chemical processes or return for storage into vegetation. Geologic storage would be one form of sequestration where the CO_2 is placed for long term storage in subsurface geological formations.[a, b, c, d]	**Applicant**: Air/fuel ratio controllers minimize CO_2e emissions from reciprocating engines. Combustion units operated with too much excess air may lead to inefficient combustion, and additional energy will be needed to heat the excess air. Oxygen monitors and intake air flow monitors can be used to optimize the air/fuel mixture and reduce the amount of energy required to heat the stream and, therefore, reduce the CO_2e emissions.	**Applicant:** Operating practices to maintain fuel efficiency of the engines, proper maintenance and tune-up of engines at least annually per manufacturer's specifications. **AQB:** The applicant listed fuel selection (i.e., diesel) and air/fuel ratio as separate control technologies, but the AQB intends to combine all of these under good combustion practices per EPA guidance. The permit will include a condition to implement GCP.
Feasibility Evaluations	**Applicant:** The feasibility of CCS is highly dependent on a continuous CO_2-laden exhaust stream, and CCS has not been tested or demonstrated for such small combustion sources. **AQB:** Not technically feasible. For this facility, CCS would require separation of the CO_2 from the exhaust stream, transport with pipelines to an underground injection well, and sequestration in the underground formation. The AQB agrees that this method would not work with an intermittent exhaust stream with a small CO_2 fraction and could result in additional air pollutants from operating the CCS system. There would be very little or no methane in diesel fuel. Any small amounts of methane entrained in the diesel fuel would be combusted and converted to CO_2.	n/a	**Applicant:** Engines will be tuned once per year, or more frequently, per manufacturer recommendations; CO_2 and CO_2e calculations performed monthly, using a 12-month rolling average, and high heat values of the fuel determined semi-annually (at minimum) per 40 CFR Part 98; fuel combusted in the engines measured and recorded using an operational non-resettable elapsed flow meter calibrated annually. **Limit from application will be as shown in the permit of 28 tpy for Unit GEN-1.** This value is calculated by using the 40 CFR 89 Subpart C to calculate a factor of 163 lb/MMBTU, which at 500 hours per year corresponds to 28 tpy. **AQB:** Good combustion practices is technically feasible for all combustion sources of air emissions.
Technically feasible?	**No**	**Yes**	**Yes**
Other	**Applicant:** The engine emits CO_2 in small and more diluted quantities. **AQB:** Agrees, that under present technologies, CCS is not the best control system for RICE engines used on an intermittent basis.	AQB: Note that section 18.6.1.5 of the application states that the unit is a rich burn engine. It is AQB's understanding that diesel engines typically run with excess air (a higher ratio or air to fuel) which would be considered inherently lean burn. However, if the fuel and air are not mixed well, there can be pockets of rich fuel to air ratios where combustion can take place. Spark ignition engines can run with either high air to fuel ratios (lean burn) or low air to fuel ratios (rich burn).	**AQB:** BACT will include all of the elements described above. **DCP will implement BACT Limits for CO_2e at 28 tpy for engine GEN-1** (information provided by applicant and checked by AQB).
Evaluate Energy, Environment, Indirect economic	**AQB:** Not technically feasible. CCS is also impractical for standby emergency generators that are used intermittently. CCS could result in additional air pollutants to the atmosphere and additional power to run the CCS system.	N/A is BACT	N/A is BACT
Economic analysis	N/A, not technically feasible	N/A is BACT	N/A is BACT
BACT Selection	**No**	**Yes**	**Yes**

a. USEPA website: http://www.epa.gov/climatechange/ccs/index.html#Federal

b. The North American Carbon Storage Atlas (NACSA) 2012. www.nacsap.org

c. USEPA Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Storage (CO_2) Geologic Sequestration Wells, Final Rule (40 CFR Parts 124, 144, 145, et al). Federal Register Vol. 75, No. 237, pgs. 77230-77303, Dec. 10, 2010.

d. Intergovernmental Panel on Climate Change (IPCC), 2005. Carbon Dioxide Capture and Storage. Cambridge University Press.

e. USEPA Guidance Document on Good Combustion Practices (DCP/Trinity provided this citation, but EPA appears to have moved it elsewhere).
All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.

Table 31.Wet Surface Air Cooler: PM BACT (Unit GEN-1)

	Drift Eliminator	**Good Maintenance and Operational Practices**
Identified Air Pollution Control Technologies	**Applicant**: Removes droplets from the air stream before exiting the WSAC relying on inertia separation caused by directional changes while passing through the eliminator.	**Applicant:** Excess water and airflow as well as bypassing Drift Eliminators promotes and increases drift emissions
Feasibility Evaluations	**Applicant**: Included in the RBLC for wet surface air coolers **AQB**: Based on RBLC CO-0057 and IA-0105, RACT for drift eliminator is 0.0005% drift.	**Applicant**: Included in the RBLC for wet surface air coolers. **AQB**: The problems described above are factors increasing drift emissions from cooling towers, as are fouling of the drift eliminator fill, irregular air flow patterns, and damaged/chipped drift eliminator blades. Drift eliminators rely on inertial separation caused by direction changes to remove droplets from the cooling towers(a). Numerous materials and conformations and conformations are feasible to enhance the droplet removal to prevent the issues mentioned above.
Technically feasible?	**Yes**	**Yes**
AQB Review	Review of current (8/2015) RBLC and AP-42 as well as manufacturer's websites showed drift eliminators are the only current control technology for this type of unit	Typical percent drift on manufacturer's website for high efficiency drift eliminator fill is 0.005%, which is what was used in the calculations and proposed as the BACT. Water recirculation rate used from manufacturer's data. Uncontrolled circulating water flow based on AP-42 factors for induced draft cooling tower and particle size distribution from a Frisbee table.
Evaluate Energy, Environment, Indirect economic	N/A is BACT	N/A is BACT
Economic analysis	N/A is BACT	N/A is BACT
BACT Selection	**Yes**	**No. The permit will limit TDS and flow rate, but these will not be required as BACT.**

a. US EPA, AP-42, Section 13.4, Wet Cooling Towers

All "applicant" statements and BACT analysis was reviewed and verified by AQB and is summarized here. For more details, see the applicant's BACT analysis.